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經濟部 國立臺灣大學合辦漁業生物試驗所研究報告

第一卷 第一號

中華民國四十五年十一月

REPORT OF THE INSTITUTE OF FISHERY BIOLOGY OF MINISTRY OF ECONOMIC AFFAIRS AND NATIONAL TAIWAN UNIVERSITY

Vol. I No. I Nov. 1956

漁業生物試驗所印行

Published by

THE INSTITUTE OF FISHERY BIOLOGY

89 Sec. III, South Sin Sun Road,

Taipei, Taiwan, China.

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DISTRIBUTION AND FLUCTUATION OF 10 IMPORTANT DEMERSAL FISHES OF THE NORTHERN TRAWLING GROUND OF TAIWAN

(SUMMARY)

LIU FAHHSUEN B. Sc. Ph. D.

The Northern Trawling Ground of Taiwan (Fig. 1) Produces a great variety of demersal fishes which form a complex animal community. Before the study of their interrelations, a preliminary survey on the distribution and fluctuation of 10 commercially important species has been made. These 10 species are Argyrosomus nibe J. & T. (black croaker), Muraenesox cinereus Forskol (conger pike or silver conger), Trichiurus lepturus Linn. (ribbon fish or bandfish), Miichthys miiuy Basilewsky, Pampus argenteus Euphrasen (butter fish), Psenopsis anomala Temminck & Schlegel (Japanese butter fish), Chrysophrys major Temminck & Schlegel (bream), Hemigaleus balfouri Day (sharks), Argyrosomus macrocephalus Tang (white croaker), Saurida tumbil Block (lizard fish). Very often each of the species is caught and packed in boxes with some other species as in Argyrosomus nibe there is sometimes found with some Johnius carutta and Argyrosomus macrocephalus; in Murenesox cinereus with some different kinds of eels; in Chrysophrys major with Evynnis cardinalis; in white croaker with Argyrosomus argentatus., Johnius carutta and Argyrosomus nibe and in Hemigaleus balfouri with some Mustelus kanekonis, Galorhinus jsponicus and Mustelus manazo etc. However it is found not obliterating the results because of the small quantity of other species mixed in the boxes.

The data of the present study is based upon the fishing log of 10 otter trawlers of China Fisheries Cooperation, formerly Fishery Rehabilitation Administration. The method used for analysis is by finding out the difference of catch per unit of effort of different fishing district and of different months. Such findings are shown in Table 2 and figures 1 & 2 as follows:

1. ARGYROSOMUS NIBE

Black croaker is found in all fishing districts but very few in regions north of 27°30′N and south of 25°N. It aggregates more in districts 200, 210, 219, 215, 388, S and T, especially 210 and 219 where it is found throughout the year. It appears that this fish disperses northernly and westernly since March and return back gradually to these districts begining from May. Its great aggregation in these districts only appears in January, February, October, November and December of the year and in April it disappears almost entirely.

2. MURAENESOX CINEREUS

The conger pike or silver conger is also found in most of the fishing districts except districts 271, 201, 276, 389 and T. It aggregates more at districts 200, 210 and 219. Greater aggregation appears in May and June and disappears since July. It is found early in January at the northern districts such as 180, 181 and 190. Then it tends to move southward and along the coast of main land. In March this fish is found densely populated as south as district 388 from where it moves northward again since April. Its turning back has caused the great concentration of such fish in the central districts such as 200, 210 and 219 in May.

3. TRICHIURUS LEPTURUS

The ribbon fish or band fish is found in all districts except in districts 388 and 210. Greater aggregation of it is found in districts 210 and 219. It aggregates more in months between June and October especially August and September. There appears two aggregated centers, one in the north as in districts 180 and 200 and the other in the south as in districts 275 and 388. During March and April that of southern center moves northward and westward and then concentrated in the middle districts, such as districts 210 and 219 where it stays for some time and some of it begin to go back south to the southern center since September.

4. MIICHTHYS MIIUY

This fish called by Chinese "Min" appears only in the northern districts and in districts along the coast of main land. It aggregates more in districts 200, 208, 273, 274 and 279 but very few and not being found in south as district 388 and 389. It begins to appear in northern districts in January and moves to districts 208, 273, 274 and 279 in February, staying in these districts until April finally disappears. Comparatively greater aggregation is found between months of February and April.

5. PAMPUS ARGENTEUS

The butter fish is found in all districts other than districts 389, 276, 201, 190, 181 and 180. It aggregates more in districts 200, 217, 275, 388 and 277 especially in districts 388, 275 and 217 where it appears in great aggregation in February. It begins to disperse northward and westward since March and totally disappears since June.

6. PSENOPSIS ANOMALA

The Japanese butter fish is found mainly in districts 219, 210 and 200 and also in the far south as districts 277 and 280, but is found few in region north of 27°30′N and non in districts 201, 218, 276 and 389. During months between January and July very few is found though scattered in various districts. It becomes more aggregated since

August and tends to move southward since September. In December, it is greatly concentrated in districts 210 and 219. The remarkable increase of the density of this fish in these districts indicates that there may be a stock comes from east of 122°E.

7. CHRYSOPHRYS MAJOR

The bream is distributed rather in the southern districts. It is very few in districts between 26°N and 27°N and none in districts of 27°N. Great aggregation of this fish is found in districts 275, 388, 280 S and T. It is very few in months between January and March but begins to increase since April. It is found in great aggregation in districts 275, 388, 280, S and T in months between May and July and vanishes since August.

8. HEMIGALEUS BALFOURI

The distribution of small shark is rather similar to bream but few can be found in north of 27°N. The districts of greather aggregation are also 275, 388, 280 S and T. It is found more in March, April and May. There is a tendency which indicates that this fish is added to this surveying area from south since March and moves north-westward in accordance.

9. ARGYROSOMUS MARCROCEPHALUS

The white croaker is also a southern species. Its distriibution is limited to the southern districts and is more aggregated in districts as that of bream and shark. It appears in all months of the year but more in months between January and May. It seems that there are two different stocks one comes from south in January moving north-westward and return back since June and the other comes from north along the coast of main land in April.

10. SAURIDA TUMBIL

The lizard fish is also not found in regions North of 27°N. Its general distribution is almost alike with bream and white croaker but its aggregated center appears in more southern districts. It is found in all month of the year but very few in June and very abundant in months between September and February of the following year. There is a tendency to show that this fish tends to move north-westward sinnce May.

There are workrs done by Japanese (1, 2, 3) which relates to the distribution and fluctuation of these fishes. It is found that the present investigation agrees mostly to these works but there are also some dissimilarities especially that of the southern species. The dissimilarities may be due to the fact that the Japanese fishing boats did not fish in this region, especially the southern part in all months of the year and on the other hand, the 10 trawlers from which the data is obtained for the presnt investigation had seldom operated in districts further north and in districts along coast of main land.

CONCLUSIONS

1. Black croaker aggregates more in districts 200, 210, 219, 388, S and T, appearing in all months of the year but more abundant in months between October and February of the following year.

2. Conger pike aggregates more in districts 200, 210 and 219, appearing in months between February and July but more abundant in May and June.

3. Ribbon fish aggregates more in districts 210 and 219, appearing in months between June and October but more abundant in August and September.

4. Min fish aggregates more in districts 200, 208, 273, 274 and 279, appearing in months between February and April but more abundant in April.

5. Butter fish aggregate more in districts 200, 217, 275, 388 and 277 appearing in months between February and April but more abundant in February.

6. Japanese butter fish aggreagates more in districts 219, 210 and 200 appearing in months between August and December but more abundant in August and in December.

7. Bream aggregates more in districts 275, 388, S, T and 280 appearing in months between March and August but more abundant in May, June and July.

8. Shark aggregates more in districts 275, 388, S, T and 280, appearing in all months of the year but more abundant in March and April.

9. White croaker also aggregates more in districts 275, 388, S, T and 280, appearing in all months of the year but more abundant in months between January and May.

10. Lizard fish aggregates more in the same districts as bream and white croaker appearing in all months of the year but more abundant in months between September and February of the following year.

臺灣北部拖網漁場十種重要底棲魚類之分佈及其變化

劉發煊　童逸修

一、引　言

現在臺灣拖網漁場僅限于北緯 21°30′ 至 29°，東經 116° 至 123° 之間之海域，其中有很多魚種混合棲息，形成一個很複雜之生物社會。在這複雜之社會中探討各種魚類之動態及其分佈變化，對于本省漁業至爲重要。

臺灣拖網漁業有奧特式拖網漁業與手操網漁業二種，其主要作業海區各不相同，前者作業幾全限于北緯 24°30′ 至 29° 之間，即本文所稱之北部拖網漁場，後者限于北緯 21°30′ 至 25° 之間，因爲手操網之資料，目前蒐集困難，本文暫不論述。至所採奧特式拖網作業海域之資料，亦僅爲民國四十三年一年內者，故本文僅能探討該海域內各主要魚類之季節變化。

二、資料來源與分析方法

民國四十三年之拖網漁船以經濟部漁管處（現中國漁業公司）所屬之奧特式拖網漁船爲主。各船構造相似總噸位均在110～136噸之間，均以基隆爲基地。在臺灣北部一帶海域作業，其中作業次數較多且漁獲紀錄比較完整者有拾艘，本文資料全爲此拾艘漁船在北部拖網漁場（如第1圖）之漁撈紀錄，其在第1圖所示範圍以外之作業，因作業密度太小，均經刪除。故分析對象亦僅爲漁獲物中拾種主要魚類即：

黑　口　Argyrosomus nibe (Jordan & Thompson) Black Croaker
海　鰻　Muraenesox cinereus (Forskol) Conger pike=Silver conger
白帶魚　Trichiurus lepturus (Linn.) Ribbon fish or Band fish
鯕　　Miichthys miiuy (Basilewsky) Min fish
鯧　　Pampus argenteus (Euphrasen) Butter fish
肉　鯽　Psenopsis anomala (Temminck & Schlegel) Japanese butter fish
鯛　　Chrysophrys major (Temmick & Shlegel) Bream
鯊　條　Hemigaleus balfouri (Day) Sharks
白　口　Argyrosomus macrocephalus (Tang) White Croaker
狗　母　Saurida tumbil (Bloch) Lizard fish

此拾種魚類之紀錄，常有類似魚種混雜其間。如黑口中常混雜有少數之白口或油口 Johnius carutta，海鰻中有不同種之海鰻，鯛中有飯魚 Evynnis cardinalis (Lacepede) 白口中有另一近

似種之白口 Argyrosomus argentatus (Houtt.) 及油口、黑口、鯊條中有 Mustelus kanekonis (Tanaka), Gulorhimus japonicus (Muller & Henle), Mustelus manazo (Bleeker) 等。但均以上列拾種爲主，其混雜者爲數甚少，並不影響分析之結果。分析方法，乃以平均一網之單位漁獲箱數爲依據。

三、船 能 比 較

在調查上述拾艘漁船，一年中在海區內作業之投網次數，均有600次以上，最高達946次，最低爲638次，平均每船有797次。全年全海區共同平均單位漁獲量爲 22.21箱（見第1表）如以 22.21箱爲基數（100%）比較各漁船一年中在全海區之單位漁獲，其中漁獲量最高之「漁平」號比平均數高出 16.88%，最低之「漁川」號比平均數低于 11.98%，即大都接近 100%，故各船能力之差異並不大。若分區而論，210區爲曳網次最多，且爲周年均可作業之漁區，其中各船共同平均單位漁獲爲23.55箱，以此爲基數（100%）比較各船之單位漁獲，最高之「漁馬」比平均數高出 17.20%，最低之「漁川」比平均數低于 13.76%，其他大都接近平均數。210區之曳網次爲全調查漁區總曳網次之 57.95%，其他各漁區曳網次均未及 8 %，所以僅以此區作業狀況觀之，已可知各船作業能力之一般。

四、重要魚類分佈之觀察

甲、一般分佈之觀察

北部拖網漁場各漁區拾種主要魚類之分佈，拾種魚類各略不同（第1圖），茲分述如下：

（1） 黑口　黑口爲拖網漁獲物中產量最多之魚種，本年度漁獲箱數略佔總漁獲箱數之 25.9 %。其分佈幾遍及調查海域內之各漁區，惟在 200、210、219、388、S及T等區則較密集，而以 210 區與 219 區產量較豐，且全年均有。至於 27°30′N 以北及 25°N 以南則很少發現。

（2） 海鰻　海鰻之漁獲箱數佔總漁獲箱數之 8.8 %。其分佈亦廣，調查區內除 171、201、276、389及T區外，其他各區均有出現，然各區密度不同，季節變動甚顯著，200、210及219諸區似較重要。

（3） 白帶魚　白帶魚之漁獲箱數佔總漁獲箱數之 9.4%，亦以210 及 219區出產最多，全調查區內除389及201兩區無其踪跡外，其他各區均有發現。

（4） 鯧　鯧之漁獲箱數佔總漁獲箱數之 0.5%，其分佈有北傾之趨勢，且接近大陸沿岸，較南漁區如388、389、S、T等區均無發現，而較多之區乃爲200、208、273、274、279等區。

（5） 鯧　鯧之漁獲箱數佔總漁獲箱數之 1.5%。其分佈除 389、276、201、190、181及180 等區無發現外，其他各區均有發現，主要漁區概在大陸沿岸與東部較深海域之中間一帶，如 200、217、275、388及277等區。

（6） 肉鯽　肉鯽之漁獲箱數佔總漁獲箱數之 2.2%，在 27°30′N 以北很少發現，此外在201、218、276及389等區均不見其出現，主要漁區在219、210及200區。較南部之漁區如277、280區亦有出現。

（7） 鯛　鯛之漁獲箱數佔總漁獲箱數之 0.5%。其分佈更限于較南之各漁區 26°N 與 27°N 之間之漁區很少發現，27°N 以北不見其踪影，聚集之處則爲275、388、S、T及280諸區。

（8） 鯊條　鯊條之漁獲箱數佔總漁獲箱數之 1.4%。其分佈情形近似鯛，亦以275、388、S、T及280等區出現最多，且較北之漁區出現較少惟其分佈範圍較廣，向北可達27°N 以北，各漁區之密度亦不如鯛之密聚一處，較爲分散。

（9） 白口　白口之漁獲箱數佔總漁獲箱數之 2.5%。其分佈亦傾向較南之各漁區27°N 以北出現甚少，較南集中之漁區與鯛、鯊條大致相同。

（10） 狗母　狗母之漁獲箱數佔總漁獲之 0.9%。狗母亦屬較南漁區之產物，向北分佈亦以 27°N 爲限。主要漁區雖與鯛、白口等相同，而其密集中心比較前者更傾南。

乙、個別之季節變化

北部拖網漁場重要魚類一般之分佈已如前述，惟均因受環境變化之影響，而發生分佈之季節變化，魚類在一年中其聚集密度，在各區均因時而異，茲分述如下：

（1） 黑口　黑口分佈在季節上頗有變化（第 2 表）全年中元、二月間單位漁獲量最高。可達 11箱以上，三月份開始降低，及至四月單位漁獲降爲 0.2 箱，五月以後乃又增高，五至九月均有 4 箱以上之漁獲，及至十月以後則增爲十箱以上。由此可知黑口在調查區域內之活動，十月至翌年二月聚集密度最大，三月開始離去，四月間魚羣幾全消逝，但不知其去向，僅見有向西分散之趨勢，五月間魚羣逐漸回返本區域，十月以後則聚集密度又復達最高峯，以迄翌年之二月。

黑口聚集密度較高之漁區爲200、210、219、275、388、S及T等區，以210、219、388及S區密度最高。元、二月間此四漁區之魚羣均甚密集，惟三月以後210及219兩區之魚羣密度逐漸降低，五月開始亦復增高。而 388 及 S 兩區，魚羣密度降低後則不見再恢復，似黑口在夏季有喜聚集于較北海區之趨勢，冬季十至十二月間 200 區爲較北之漁區，魚羣密度降下甚低，210 及 219 兩較南之漁區魚羣密度增加甚大，388 及 S 兩較南之漁區，魚羣密度此時亦應甚高，惜此時該漁區內所有漁船均無作業。

（2） 海鰻　海鰻在一年中自二月至七月間單位漁獲均在 1 箱以上，五、六月之單位漁獲特高，超過 5 箱，其他各月則不及半箱。

分區觀之，元至三月魚羣分佈甚廣，北迄172區南迄279區均有出現，其集中之漁區如以單位漁獲在 1 箱以上者觀之，元月間爲較北之 180、181 及 190 三區，較南之漁區很少，二月間爲較南之 217、274、275及 277諸區，北部 27°N 以北無作業，不能知其情況，三月間凡有其發現之漁區單位漁獲量大部均在 1 箱以上，北部有190區之五箱，南部有388區之四箱，中有210與219之 5 箱以上等紀錄，此時魚羣雖北迄172區，南迄 279與 280區，均有發現，甚爲分散，然有向中部集中之趨勢，此種趨勢，三月以後表現愈顯明，四月間海鰻羣近大陸沿岸，自四月起 275 區以南幾不見其踪跡，雖北部 27°30′N 以北此時以後無作業，但海鰻自此時起開始向北移動，魚羣逐漸集中之趨勢，則甚顯明，五、六月之高漁獲或係由此造成。

海鰻之重要漁區爲200、210 及 219 三區，210 區全年中除四月以外均有漁獲，200 區七月以後則絕跡，三區均以三至六月魚羣較集中。210及219兩區，七月以後各月單位漁獲均不能達到半箱。

（3） 白帶魚　白帶魚一年之間六至十月魚羣較集中，此時間內各月平均單位漁獲在2箱以上，八、九月間魚羣最密集，平均單位漁獲在6箱以上。

分區觀之，元、二月間27°N與26°N之間各區單位漁獲均不及1箱，以北至180及200區單位漁獲則在2箱以上，以南有275、388及S區均超過1箱，此時似爲北南兩魚羣之聚集中心。三、四月間北部中心仍然存在，但南部中心却逐漸喪失，自五月開始魚羣則逐漸集中于27°N與26°N間之210與219兩區，此時以後北部因無作業，不知究竟，南部中心各區則逐月減少，而至全部消逝，迄九月間南部277、280區復增至1箱以上，十與十一月間280區單位漁獲竟達兩箱，似此南部中心自九月開始有再恢復之趨勢，又南部中心之魚羣自三月開始有逐漸向大陸沿岸移動之傾向，而此種移動有南北分散之勢。

最重要之漁區爲210及219兩區，210區全年皆有白帶魚出現，元至四月間單位漁獲不及1箱，五至十月間則增至兩箱以上，尤以八、九兩月則高達6箱以上，十一、十二月則復降至1箱以下，219區四月間才有發現，五至十月間，除七月外，亦均有兩箱以上之單位漁獲。

（4） 鯕　鯕魚在調查區內出產甚少，各月平均單位漁獲最高者爲半箱，全年中平均單位漁獲在0.1箱以上者僅爲二至四月，以四月最高，爲0.59箱。

鯕魚在元月間北部較多，自二月開始逐漸南移達大陸沿岸之208、273、274以至279諸區，四月以後全部調查區域內之各漁區均少見其踪跡，但北部無作業，不知其究竟，週年不見其有密集之聚集中心，279區在四月間有4箱以上之紀錄，然亦曇花一現而已。

（5） 鯧　鯧魚在調查區內出產亦甚少，全年間平均單位漁獲在半箱以上者爲二至四月，以二月魚羣最集中，單位漁獲接近3箱（2.96）。

鯧魚在較南之漁區較集中，27°30′N以北在元、二月間不見其踪跡，元月份僅209與217兩區，單位漁獲有半箱以上，二月份魚羣則集中200、217、275、277、388及S區，單位漁獲均高達1箱，尤以較南之217、275、388之三個隣近漁區，魚羣最密集217區有5箱以上，275、388兩區均有6箱以上單位漁獲，三月魚羣開始分散26°N以南之388、S、T諸區，自此以後踪跡渺渺，而27°N以北之漁區如191、172及171諸區在元月無其踪跡，而三月份則有半箱以上之單位漁獲，似其分散有北移之趨勢，但在三、四月較南漁區之魚羣分散，發現之區域很廣，故北部漁區172、171及191諸區之魚羣，確係南部魚羣北移所致，或係更北部之魚羣南移所致，有待進一步之探討。又接近大陸沿岸之199、208、273、274諸區，三、四月間有發現較高之單位漁獲，可見其有向大陸沿岸移動之勢。六月以後全部調查漁區內幾全無其踪跡。

全區中魚羣聚集最密之漁區爲388、275與217三漁區，單位漁獲均在5箱以上，但僅能維持二月份一個月之時期。

（6） 肉鯽　肉鯽全年出產最豐之時期爲八至十二月，此時期內單位漁獲較高之月份爲八月及十二月，均有2箱以上。

分區觀之，肉鯽在元至七月間各魚羣均甚零星，全區幾無半箱以上單位漁獲之紀錄，尤其六月，全區不見其影踪，七月開始，則逐漸集中於200、210及219諸區，九月間277區有2箱以上之單位漁獲。

全區中重要漁區爲200、210及219三區200、210區全年大多月份均有發現，惟秋冬季密度較高，219區則春季無發現，亦以秋冬密度較高，此諸區內密度之增高，或係由于星散各區魚羣之集中，此種趨勢可以五至八月間26'N以南漁區魚羣之消逝現象見之，但此南部漁區在九月間如277、280及S區又復有其出現，且277區九月及280區十月亦有相當密度魚羣之發現，而210與219兩區之單位漁獲亦在此時期內隨之而降低，似魚羣在此時期內又復向南分散，然210與219兩區在十二月間單位漁獲均甚高，此時219區單位漁獲竟高達11.25箱，誌成全年各區最高之紀錄，然在200區內並無發現，219區之高密度魚羣似有來自122°E以東之魚羣加入其中。

（7） 鯛　鯛在調查區內產量甚少，週年以五至七月產量較豐，其他各月單位漁獲均未及0.1箱。

元至三月在較南各漁區出現甚少，自四月起逐漸開始增加，而其出現區域亦廣，五至七月在275、388、S、T及280諸區均有1箱以上之單位漁獲，八月以後則逐漸消逝，僅280區十一月間尚有0.5箱以上之單位漁獲，可見自三月開始魚羣似有北移之傾向，而至冬季則復返南。

（8） 鯊條　鯊條亦爲較南漁區產量較高之魚類，週年均有出現，惟僅三、四兩月產量較豐，單位漁獲超過半箱以上，27'N以北各漁區產量甚少，其他漁區則週年均有出現。

鯊條聚集密度較高之漁區爲280、388、S、T及275等較南漁區，三至五月間較北漁區如208、209等區亦有1箱以上之單位漁獲，在此期間，魚羣有北西移動之傾向，然三、四月間較南漁區如275、277、279、280、388，S、T諸區之魚羣密度仍相繼增加，其所以然者或係由于有來自更南漁區魚羣之加入，210區全年各月除四月外均有其出現，但其密度並不高。

（9） 白口　白口亦係較南漁區之產物，全年均有，然以元至五月產量較豐。

元、二月間白口之聚集較密之漁區爲275、388、S及T區，尤其275區在元月間與T區在二月間魚羣密度爲全年之冠，單位漁獲均高達14箱以上，三月間各區消逝，然最南之280區此時始有出現，並有6箱以上之單位漁獲，四月其出現漁區甚廣，較南之279、277及276區魚羣密聚，尤以279區有7箱以上之漁獲，388、S、T及275區密度亦甚高，較北漁區亦自四月開始有出現及至五月接近大陸沿岸之漁區如208、209、217及218區密度增加，元至四月間在較南漁區之魚羣似有向北西移動之趨勢，然自四月開始較北漁區始有出現，並在接近大陸沿岸逐漸增加，此時期較南漁區之魚羣亦隨之增加，此或係由于來自北方大陸岸之魚羣集中本調查區域內所致，六月以後魚羣雖逐漸消失，然在七月至十月間于217、218、273、277及388等區時有4箱以上之單位漁獲，十一、十二月則魚羣消逝，僅在219區有1箱以上漁獲之發見。

全區中最重要漁區爲275區，自元至七月均有1箱以上之單位漁獲。388、S及T區亦甚重要，除三月外元至五月均有魚羣密聚其中。

（10） 狗母　狗母亦係較南漁區之產物，全年均有，以六月最少，九月至翌年二月較豐。

元至四月間275、388、S及280區等較南漁區密度較高，26'N與27'N之間產量甚少，27'N以北幾全沒有發現，五至八月全區均少，七月間只在273、217及275有出現，似是魚羣向北西移動，接近大陸沿岸，九月至十二月間26°N與27°N間之209、210、218及219諸區均有半箱以上之單位漁獲，最南端之280、277區亦有較多之出現，惟在275、388區等中間區域無資料，不能知其是否爲新

進入本區之魚羣。

五、檢　　討

東海、黃海之各種底棲魚類過去在日本已有很多調查研究，其中對于各魚類之分佈作全般的探討者有笠原昊之報告及專任東海、黃海資源調查之水產廳西海區水產研究所之研究報告，現在參考這些文獻及民國四十三年（1954）在本文海域日本漁船之作業成績對各魚類分別予以檢討。

（1） 黑口　據西海區研究所之報告[1]東海、黃海之黑口分佈仍以本海域爲最重要，其分佈變化冬季十月至翌年二月由北向南移動到臺灣北部沿岸，此時期魚羣密度爲全年中最高。三、四月減少，以後各月概少，與本文所述之分佈變化大致相同，惟七月以後日本漁船在本海域殆無作業。但據1954年日本漁船之作業成績[2]元、二月間27°30′N以北漁區及199、218區均有較多之漁獲，而本省漁船却未有漁獲，或因作業次數極少所致，似示本海域內冬季黑口之分佈相當廣寬，密度亦甚高。

（2） 海鰻　據1954年日本漁船之漁獲紀錄[2]在東海南部元月間自長江口132、133區至大陳島180、181區附近有海鰻之密集魚羣出現，沿大陸海岸開始南移，以迄三月魚羣先端到達東引島275、S區止，魚羣中心接近大陸沿岸，四月後復北上，到八月間魚羣幾全離開本文所稱之海域而分散。然據本省漁船之紀錄，元月開始出現于本海域北部逐漸南下，四月接近大陸岸，五、六月經過219、210區而北上，八月離開本海域。則兩者之分佈變化完全相同，西海區研究所報告之魚羣移動狀況亦與此相同[1]。

（3） 白帶魚　本海域中元至五月間日本漁船之白帶魚漁獲不多，元、二月與本省漁船同樣在本海域南北兩端有漁獲中心，而在本海域白帶魚旺漁期之六至十月間日本漁船很少作業[2]，西海區之報告僅稱本海域恰爲東海白帶魚之南部漁場，故171、172區則爲白帶魚中部漁場之南端，而元、二月間在28°N以北之聚集魚羣乃屬中部漁場者，南部漁場275、388及S區之魚羣中心，春季北上接近大陸海岸後，六至十月集中於210、219區九月後開始南下，形成277、280區之漁獲，在本海域內南北移動。

（4） 鯧　據西海區研究所之研究，東海、黃海之鰺魚大約可分四羣。其中最南一羣之漁場則在本海域北端，元至五月有南移接近大陸岸之傾向[1]。1954年度元至五月，日本漁船也在本海域之北端160區以南一帶有漁獲，魚羣中心有南移之傾向，漁場南迄200區，六月以後沒有漁獲，則與本文之鯧魚分佈變化完全相符。

（5） 鯧　鯧魚在本海域以外之東海、黃海均很少出現，過去僅有笠原之報告可資參考[3]。據稱主要魚羣由臺灣海峽北部沿大陸岸向東海北部移動，主要漁區爲217至161間諸區，然看本文則二月間以海峽北部275、388及217區爲中心。魚羣逐漸向北移動，六月間已離開本海域，此時以後日本漁船也無發現魚羣之報告，似魚羣已極端分散，或經進入未有作業之大陸沿岸海域。

（6） 肉鯽　肉鯽亦爲南方系之魚類，在東海、黃海中僅本海域出現較多，據笠原之報告[3]，其移動雖然年年有相當之變動，大略二月自臺灣海峽經過本海域北上至長江口，九至十月再南下，漁獲中心爲210、219、217區與172、162區。但據日本漁船在1954年之漁獲狀況[2]，元至三月在122°E以東之182、191、201、202及211區有南下魚羣出現，四至七月漁獲甚少，八、九月以後在本

海域內有開始南下之傾向，此時自舟山島外海至200、201、210區爲良好漁場。本省漁船於元至三月沒有在122°E以東作業，故未有南下羣之漁獲，而在200、210、219區於七至九月及十一、十二月有兩次魚羣集中現象，後者似爲上述九月由長江口南下之魚羣，前者似是分散附近海域之魚羣集中所致。

（7） 鯛　據笠原之報告[3]在本海域鯛之分佈極少。但看日本漁船之漁獲狀況[2]臺灣海峽北部之219、388、T、S及274區在元至五月有南下魚羣之漁獲，魚羣中心有1～2箱以上之單位漁獲，六月以後沒有在此作業。本省漁船在同漁區內元至三月甚少漁獲，反在四月以後至九月有出現，並且此期間內魚羣有南北移動之現象，則兩者不太符合，惟據笠原之報告及1954年日本漁船之紀錄，三至九月之該漁區恰爲鯖魚之漁場，並有魚羣南北移動之現象，可能鯛魚漁獲紀錄中，有鯖魚之混雜所致。

（8） 鯊條　日本漁船1954年在本海域周年均有鯊條漁獲[2]但仍以元至六月爲主要，單位漁獲常有5箱以上之多，主要漁場與本省漁船大致相同，在208、209、217、218、275、277、S及T區等，亦在四、五月間漁獲中心有北西移動，但南部尙有相當之漁獲，分佈變化之大致情形與本文相同。

（9） 白口　笠原有推定臺灣海峽有南北移動之魚羣，於初夏及秋季在臺灣北部較多，並且更北方另有一羣在杭州灣至217、218區南北移動，五月間始北上，則此時與海峽魚羣相混合。西海區研究所因缺少本海域之資料，未經詳細探討，但亦有認爲本海域似有不同種的二羣白口混在，1954年度日本漁船在此域雖亦很少作業，其漁獲狀況與本省漁船大致相似，因而據本文在較北漁區五月間之北上羣，雖有二羣混雜之慮，但仍可認定在臺灣海峽北部有三至五月北上，七至十月南下之魚羣。在海峽北部漁獲之白口除十二月至翌年二月外週年均爲 Argyrosomus macrocephalus Tang（日本俗稱謂臺灣白口）。而十二月至翌年二月則不見此種，却以 Argyrosomus indicus Tang 爲主。所以元、二月間密集在275、S、T區之魚羣似爲由北方下來越冬之魚羣。

（10） 狗母　據西海區研究所之報告[1]東海之狗母漁場在東海中央部至南西方之海域，則爲本文海域之東北方，最盛漁期爲九至十二月。元至三月到深海越冬，四月開始向大陸岸移動。本省漁船元至四月在海峽有漁獲，似是與此不同之海峽魚羣，並自四月北上接近大陸岸，以後九至十一月亦在海峽有其南下傾向。另外在較北漁區209、210、218及219區九至十二月有出現，似是前述東海主羣之南端。

六、結　　論

本文所採資料，僅爲中國漁業公司拖網船一年之作業紀錄，茲僅就此資料之觀察狀況，總括報告如後：

（1） 黑口　中心漁區爲200、210、219、388、S、T等區，以210爲最優，終年均有出現，但十月至翌年二月聚集密度較大，其他各月均甚分散。

（2） 海鰻　重要漁區爲200、210及219諸區，全年中二至七月均有出現，惟以五、六兩月聚集密度特大。

（3） 白帶魚　重要漁區爲210及219兩區，全年六至十月均有出現，惟八、九兩月魚羣較密集。

（4） 鮸　出現以較北之漁區，以 200、208、273、274、279 等區魚羣較集中，全年二至四月均有出現，以四月較多。

（5） 鮸　主要漁區爲 200、217、275、388及 277等區，全年二至四月出現較多，以二月魚羣最密集。

（6） 肉鯽　主要漁區爲 219、210及 200區，全年八至十二月均甚豐，八、十二兩月特豐。

（7） 鯛　主要漁區爲275、388、S、T及280諸區，全年五至七月魚羣較集中。

（8） 鯊條　主要漁區爲275、388、S、T及280等區，全年均有出現，惟三、四兩月特多。

（9） 白口　主要漁區亦爲 275、388、S、T及 280等區，全年均有，然以元至五月產量較豐。

（10） 狗母　主要漁區與白口、鯛相同，全年均有出現，惟九月至翌年二月較豐。

七、參 考 文 獻

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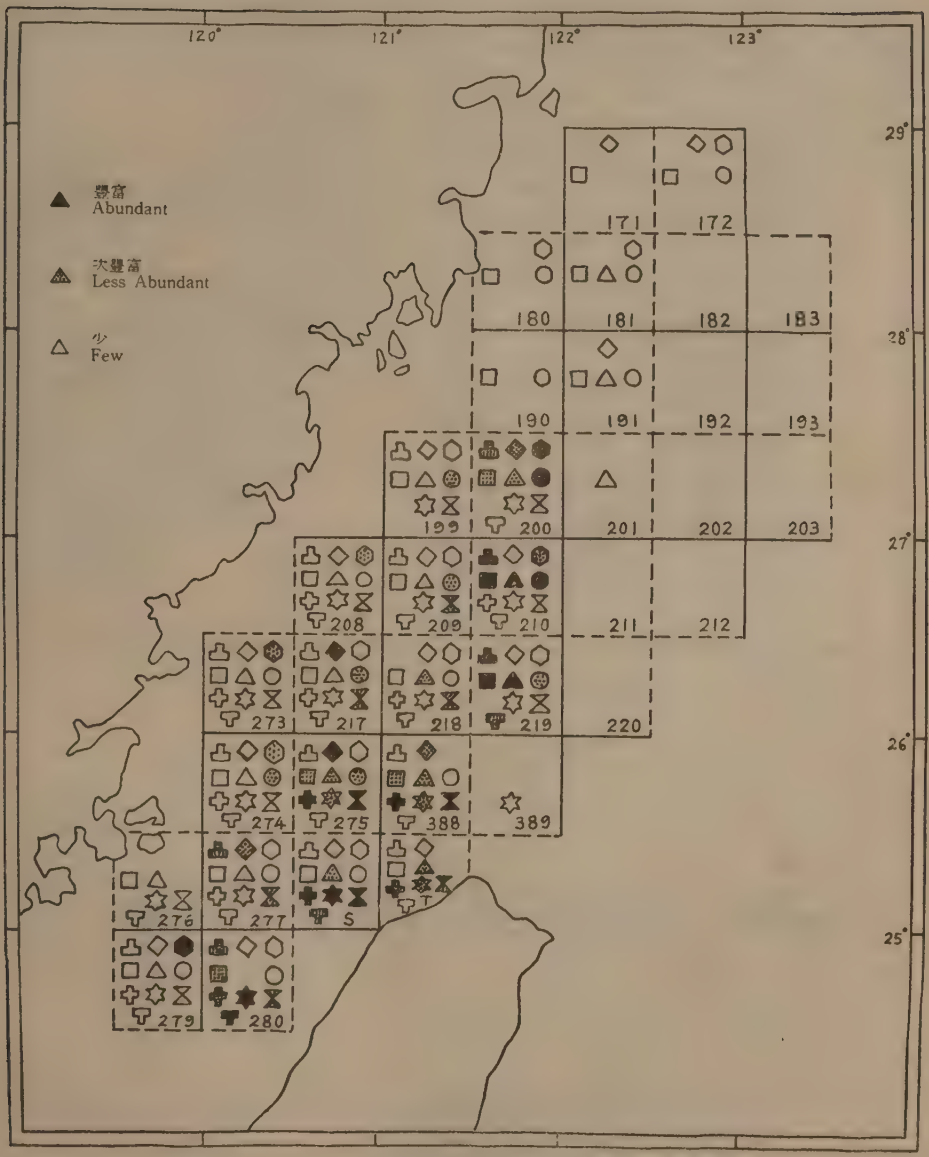
（2） 日本水產廳西海區水產研究所、福岡漁業調整事務所：東海、黃海の底魚漁場圖　第5～7號。
（3） 笠原昇：支那東海、黃海の底曳網漁業とその資源　日本水產株式會社研究所報告　第3號。

第一圖　北部拖網漁場重要魚類一般分佈圖

Fig.1 Cenеral Distribution of 10 Important Fishes of The Northern Trawling Ground, 1954.



△ 黑　口 Argyrosomus nibe

○ 海　鰻 Muraenesox cinereus

□ 白帶魚 Trichiurus lepturus

⬡ 鯖　 Miichthys miiuy

◇ 鯧　 Pampus argenteus

凸 肉鯽 Psenopsis anomala

✣ 鯛　 Chrysophrys major

✡ 紫條 Hemigaleus balfouri

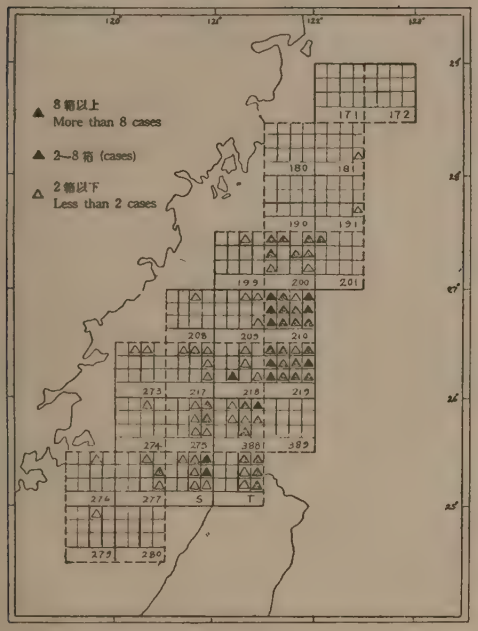
⧖ 白口 Argyrosomus macrocephalus

⍑ 狗母 Saurida tumbil

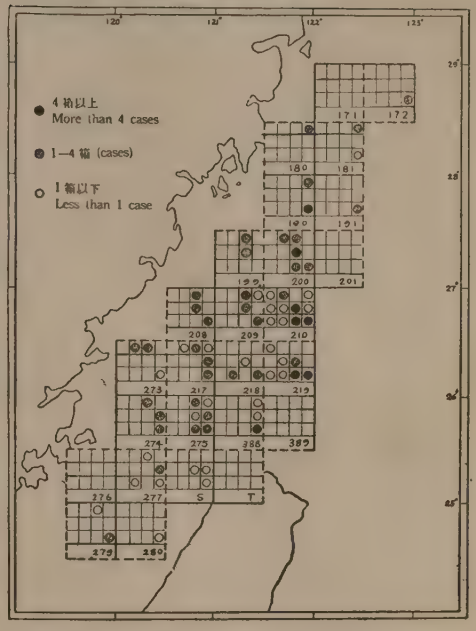
第二圖　十種重要

Fig. 2　Monthly Fluctu

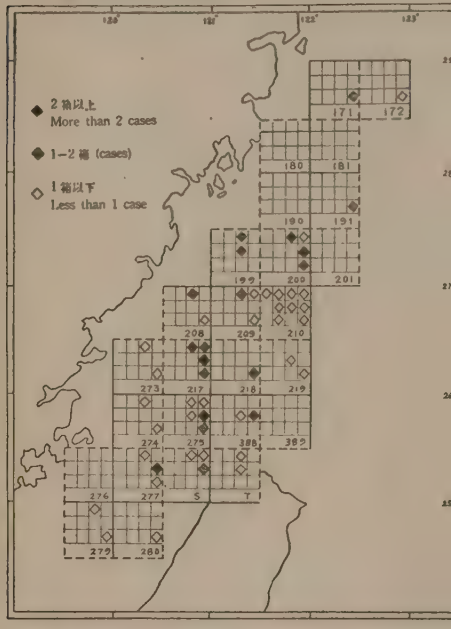
(1) 黑口 Argyrosomus nibe



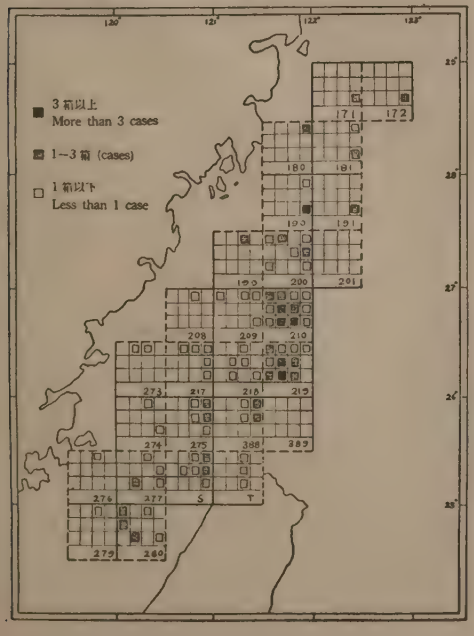
(2) 海鰻 Muraenesox cinereus



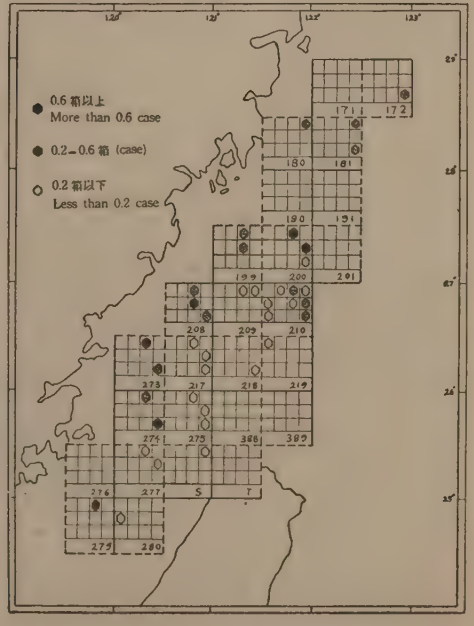
(5) 鯧 Pampus argenteus



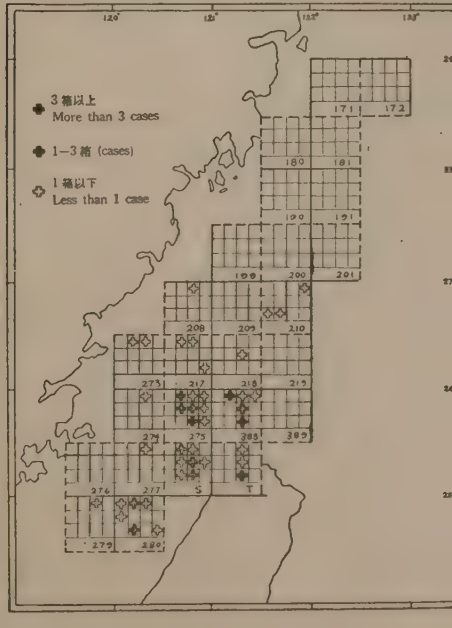
(3) 白帶魚 Trichiurus lepturus



(4) 鯡 Miichthys miiuy

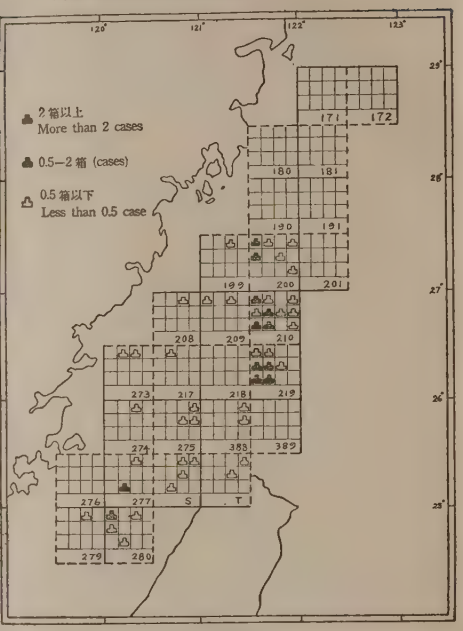


(7) 鯛 Chrysophrys major

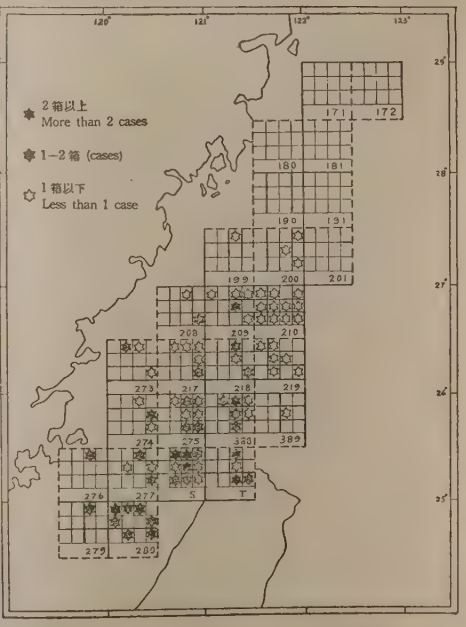


類月際分佈變遷圖
on of 10 Important Fishes

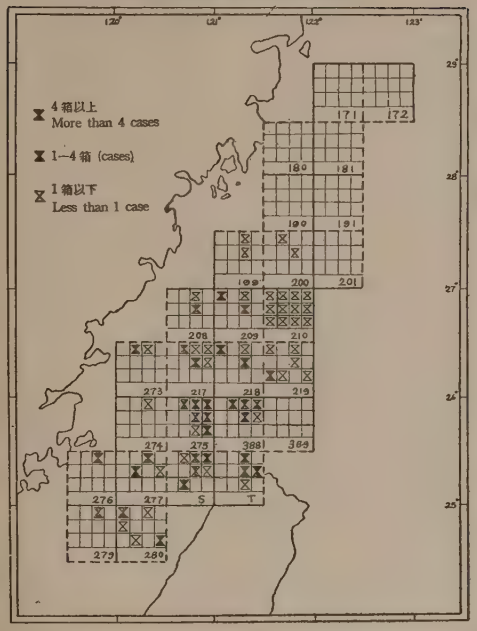
(6) 肉鯽 Psenopsis anomala



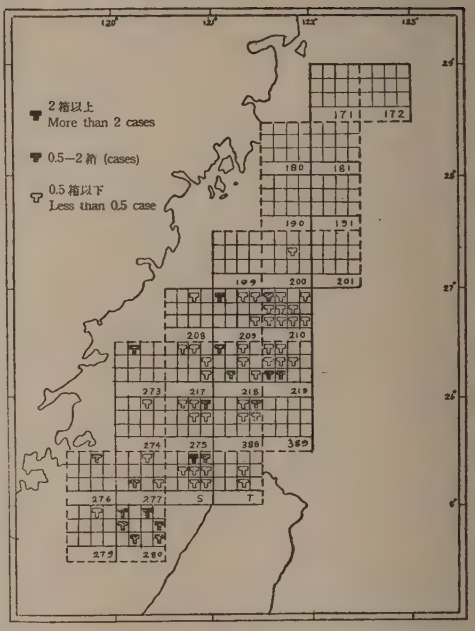
(8) 黃條 Hemigaleus balfouri



(9) 白口 Argyrosomus macrocephalus



(10) 狗母 Saurida tumbil



說 明
Explanation

各漁區內小方格表示月份，其排列順序如下：

The small squares within each fishing district indicate monthes of a year arranged in order as shown below.

第一表　四十三年度十艘拖網漁船單位漁獲量表

Table I. Catch Per Unit of Effort of 10 Otter Trawlers, 1954

漁區 Fishing District * / 漁船 Trawler Name	漁馬	漁甬平	漁桂漢	漁川澄	漁滬津	漁皖	曳網合計 Hauls Total	總漁獲量 Total Catch	平均單位漁獲 Average Catch Per Haul	曳網次百分比 Hauls %
171	1 13.00						1	13	13.00	0.01
172	2 14.50						2	29	14.50	0.03
180		2 13.00					2	26	13.00	0.03
181	1 15.00	7 10.57					8	89	11.13	0.10
190		7 7.00					7	49	7.00	0.09
191	1 10.00	2 9.50					3	29	9.67	0.04
199	3 23.00	8 19.63	3 15.00	25 26.28	10 13.80	5 14.40	54	1,138	21.07	0.68
200	47 21.13	60 23.70	7 18.14	36 21.08	21 13.90	68 21.88	25 21.08	18 18.56	42 20.67	33 21.88	357	7,532	21.10	4.48
201	1 10.00						1	10	10.00	0.01
208	4 14.25	18 23.50	6 16.83	22 13.55		20 20.55	4 11.00	10 9.40		2 15.00	86	1,458	16.95	1.08
209	6 23.17	30 11.13	2 17.50	4 8.75	8 6.63	5 13.80	22 13.55	2 10.50		9 13.00	88	1,101	12.51	1.10
210	504 27.60	467 24.80	442 26.79	376 23.34	537 22.58	467 20.31	375 22.61	355 21.21	583 24.90	513 20.54	4,619	108,782	23.55	57.95
217	11 18.55	48 16.23	40 16.95	40 12.38	21 11.14		39 13.36	18 15.28	32 17.78	10 12.60	259	3,881	14.98	3.25
218	9 22.00	13 10.15	1 13.00	13 16.31	7 11.57	19 14.79	10 7.80	7 13.43	28 17.57		107	1,581	14.78	1.34
219	58 27.55	99 26.58	145 30.63	113 32.86	13 29.62	21 18.95	68 22.53	62 28.18	8 8.25	43 19.02	630	17,330	27.51	7.90
273	73 21.40	1 9.00	8 23.88	29 17.00	28 20.89	18 15.33	58 17.14	59 19.49	32 16.25	48 21.92	354	6,832	19.30	4.44
274	28 19.46	31 25.61	32 20.34	8 18.63	21 16.14	27 20.96	48 14.06	10 18.80		82 16.41	287	5,253	18.30	3.60
275	17 12.59	61 15.13	15 15.60	85 16.68	57 29.60	28 18.96	22 10.50	28 17.50	71 26.46	26 21.38	410	8,163	19.91	5.14
276		1 36.00					1 15.00				2	51	25.50	0.03
277	11 22.36	8 24.13		6 25.50	53 18.45		4 9.75	10 24.20		48 22.75	140	2,943	21.02	1.76
279		22 21.05	3 60.00		4 5.50	11 17.45	2 9.50	4 21.75			46	963	20.93	0.58
280	2 16.50	1 6.00		2 3.50	40 15.56	19 14.26		1 11.00	9 21.67	18 14.22	92	1,402	15.24	1.15
388	21 18.95	18 16.72	21 22.57	16 28.06	1 12.00			10 25.40			87	1,888	21.70	1.09
389					3 11.67						3	35	11.67	0.04
S	16 16.00	42 25.69	7 12.14	37 24.38	27 9.11		42 23.33	24 24.25		28 15.11	223	4,553	20.42	2.80
T	2 24.50		8 14.38	6 38.67		31 14.29	4 12.25	20 35.25	31 9.61		102	1,891	18.54	1.28
曳網合計 Hauls Total	818	946	740	818	841	744	729	638	836	860	7,970			
總漁獲量 Total Catch	20,518	21,433	19,214	18,749	17,695	14,518	14,553	13,803	19,403	17,076		177,022		
平均單位漁獲 Average Catch Per Haul	25.12	22.66	25.96	22.92	21.04	19.55	19.96	21.63	23.21	19.86			22.21	
平均單位漁獲百分比 Average Catch Per Hual %	113.10	102.03	116.88	103.20	94.73	88.02	89.87	97.39	104.50	89.42				

*……上爲曳網次數；下爲單位漁獲量

Upper—Number of Hauls; Lower—Catch Per Haul

第二表　四十三年度十

Table II. Catch Per Unit of Effo

| 漁區 Fishing District / 魚種 Kind of Fish / 月份 Month / 單位漁獲量 Catch Per Unit of Effort | 黑口 Argyrosomus nibe I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | 平均 Average | 海鰻 Muraenesox cinereus I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | 平均 Average | 白帶魚 Trichiurus lepturus I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | 平均 Average | 餽 Miichthys miiuy I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | 平均 Average | 鯧 Pampus argenteus I | II | III | IV | V | VI | VII | VIII | IX | X | XI |
|---|---|---

魚類單位漁獲量表

of 10 Important Fishes, 1954.

| 平均 Average | 肉鯽 Psenopsis anomala | | | | | | | | | | | | 平均 Average | 鯛 Chrysophrys major | | | | | | | | | | | | 平均 Average | 紅 條 Hemigaleus balfouri | | | | | | | | | | | | 平均 Average | 白 口 Argyrosomus macrocephalus | | | | | | | | | | | | 平均 Average | 狗 母 Saurida tumbil | | | | | | | | | | | | 平均 Average | 種魚 Kind of Fish / 月份 Month / 漁獲單位量 Catch Per Unit of Effort / 漁區 Fishing District |
|---|---|---

A REVIEW OF SCIAENOID FISHES OF TAIWAN

by

CHU KUANG-YU*

According to the statistical report by Taiwan Fisheries Production Committe, the total catch of Sciaenoid fishes in 1955 has amounted to more than eight thousand tons, only next to Chanidae in abundance. This catch consists of 4799 tons of white croakers (three species in this group), of 3058 tons of black croakers (one species), of 326 tons of the so-called Min crorkers (three species of large size) and of 45 tons of yellow croakers (two species). In spite of their importance to the economy of Taiwan, their taxonomic state is still in confusion. It is the purpose of this paper to make some clasifications in respect to taxonomy of sciaenoid fishes.

Regarding this family, while the following workers have contributed a lot on their particular regions, i. e., Lin, Tang and Fowler on China coast, Fowler on Philippine and its adjacent waters, Weber and de Beaufort on Indo-Australian waters, and Matsubara on Japan and its adjacent waters, it is hoped that the present paper has covered a region just to fill the gap of the above-mentioned localities so as to give some light on the geographical distribution of this group of fishes.

In the present paper is given a review of the species of Sciaenoid fishes known to inhabit the waters of Taiwan (Formosa), with descriptions of a new and 10 unrecorded species. It is based on the collections made by the writer for a whole year beginning July, 1955 to June 1956 at the fish markets around Taiwan. Series of the species obtained have been deposited in the Museum of the Department of Zoology, National Taiwan University.

In this work, the measurements were made by means of a divider and a proportional scale. The length of body was taken from the tip of the snout to base of the middle ray of caudal fin; the greatest depth of body was the perpendicular depth immediately in front of the second dorsal; the length of head was the distance from the most anterior portion on the snout to the most distant point on the opercular membrane. Depth of head was measured from the midline at preopercle vertically downward to ventral contour of head. Head width was the greatest dimension when opercles were forced into a normal position. The angle of head profile was measured by an anglemeter when the mouth was closed.

The author is indebted to Dr. S. L. Chien, president of the University, to Dr. Yu-hsi Moltze Wang, Chairman of the Department of Zoology, and to Dr. F. H. Liu, director of Fishery Biology Institute of this University for facilitating his work in every way,

* Contributions from the Department of Zoology, National Taiwan University. The expense of this work was supported by the research fund from Fishery Biology Institute of National Taiwan University.

as well as to Mr. H. T. Tung, director of the Taiwan Fisheries Research Institute, and to Mr. Y. S. Liang, curator of fish collections of Taiwan Museum for generously presenting their specimens at his disposal. He also offers his best thanks to Drs. T. F. Chen, K. Matsubara, and D. Barker for lending or giving him important references. The author also gives his best thanks to Messers I-show Tung, C. F. Tsai and K. C. Shang for assisting him in collecting the specimens and to Mr. Y. Y. Lin for taking pictures of the fishes.

KEY TO GENERA

1a. A barbel on chin.....*Sciaena*
1b. No barbel on chin.
2a. A strong canine on mandibular symphysis and two in front on upper jaw.....
.....*Otolithes*
2b. No such canines as above.
3a. Pores on chin, small and not distinct, 4 or 6 in pairs; lower jaw slightly projecting or slightly included, or jaws equal in front.
4a. Soft dorsal and anal densely scaled at least one third the way up the fins.
5a. Head large and blunted; soft dorsal and anal entirely covered by small scales; lower side of body yellow in life.....*Pseudosciaena*
5b. Head pointed; only one third of the soft dorsal and anal densely covered by scales; body dark gray in life.....*Miichthys*
4b. Soft dorsal and anal naked, with only a narrow basal sheath.....
.....*Argyrosomus*
3b. Pores on chin large and distinct, 5 in number; lower jaw usually included.
6a. Soft dorsal and anal covered with small scales.....*Johnius*
6b. Soft dorsal and anal naked, with only a narrow sheath on base....*Nibea*

Sciaena Linnaeus

Sciaena Linnaeus, 1758, p. 288. (Type species *Sciaena cirrhosa*, by subsequent designation of Bleeker, 1876, p. 326).

Body oblong, compressed. Head obtuse. Snout very prominent, with several pores at tip, edge of rostral fold cut into four lobes, not covering tips. Eyes large, advanced, in front half of head. Maxillary mostly concealed under preorbital sheath. Mouth small, inferior, horizontal, with lower jaw included. Five pores on chin, median sometimes obsolete. A single barbel on chin. Premaxillary teeth in villiform band, outer series slightly enlarged and rather close set. Lower teeth uniformly villiform. Preopercle serrated. Opercle ends in two flat spines, lower longer, Short rudimentary gill rakers less than 15 on first arch. Pseudobranchiae developed. Scales on head and body ctenoid, or cycloid. Soft dorsal and anal covered with small cycloid scales. Caudal cunneate, rounded truncate or emarginate. Dorsal with X to XIII spines, rays 22 to 31, deeply incised, first spine minute, seccond, third and fourth longest, sometimes filamentous.

Soft dorsal low. Second anal spine strong, robust, longer than half of first anal ray. Pectoral pointed. Ventral short, filamentous.

Tropical and subtropical coastal fishes, widely distributed in the Indian Ocean, Malaya, the Indo-Australian Archipelago, Philippines, Indo-China and China. (Fowler).

Sciaena dussumieri (Cuvier and Valenciennes)

Umbrina dussumieri C. & V., 1833, p. (355) 481 (type locality: Coromandel)._____ Chu, 1931, p. 135 (reference)._____Herre and Myers, 1937, p. 30 (Perak).

Corvina dussumieri Bleeker, 1873, p. 142 (reference)._____Chen, 1952, p. 331 (ref).

Sciaena dussumieri Tang, 1937, p. 77 (Hainan Island)._____Lin, 1938, p. 372 (Yang Kiang)._____Fowler, 1949, p. 47 (compiled)._____Chen, 1952, p. 331 (ref.).

Umbrina amblycephalus Kner, 1868, p. 320 (Formosa).

Body oblong, compressed, the greatest thickness of body 1.59–1.63 in its greatest depth. Dorsum rising upward about an angle of 30 to body axis from snout tip to origin of dorsal, thence arched a little to origin of soft dorsal from where the dorsal profile sloping downward to the base of end of soft dorsal. Upper edge of caudal peduncle concave to the base. Venter more or less straight or a little arched. Head obtusely pointed. Eye moderate, anterior and above, its lower margin above horizontal through commencement of gape of mouth. Mouth inferior or lower jaw included, slightly oblique. Maxillary concealed under preorbital sheath, exposed only small portion of hind part, extending to posterior edge of pupil. Snout rounded, very prominent, rostral fold overhanging lip, with eight pores, upper two lateral pores on each side, small, other four pores distinct, three of them arranged in a curved row over the larger median one immediately above rostral margin which is deeply incised into four lobes. Nostrils two, anterior one small and rounded, posterior one large, ovate, close to eye. Lips thick, fringed along edge in contact with teeth. Mandible with five distinct pores on chin, immediately behind median pore a short robust barbel, one fourth of eye diameter. Teeth in upper jaw of two series, outer series conical, enlarged, strong toward anterior, continuous at symphysis; inner series in villiform band. Mandibular teeth uniformly villiform, interrupted at symphysis. Vomer and palate toothless. Tongue short, with rounded tip. Preopercle not denticulated. Opercle with a flat spine. Gillrakers very short, 3–4+6–7, some rudimentary, longest 2.60–3.50 in filament which is about 8.30–8.60 in head.

Head 3.23–3.51, greatest depth 3.66–4.10 in standard length. Width of head 1.60–1.64, height of head 1.23–1.41, least depth of caudal peduncle 3.00–3.33, horizontal diameter of eye 4.41–4.76, interorbital distance 3.11–3.33, snout 3.48–3.52, postocular portion of head 1.83–1.96 in head. Distance from tip of snout to origin of dorsal 2.86–3.08, to origin of ventral 3.14–3.16, to origin of anal 1.43–1.47. Least depth of caudal peduncle 2.50–2.61 in its length which is 1.24–1.32 in head.

Dorsal IX/I/24, first spine nearly imbedded, second spine longest, 1.26–1.79 in head, first dorsal ray longest, 3.14–4.10 in head. Anal II.7, first spine nearly imbedded, second

spine longest, 4.00–4.80 in head or about half as long as first anal ray which is 2.08–2.44 in head. Origin of anal opposite 10th soft dorsal ray. Pectoral falciform, 17, its longest ray 1.30–1.47 in head. Pelvics (vertral) I, 5, its longest ray 1.63–1.79 in head. Caudal cunneate, 17, its longest ray 1.83–2.00 in head.

Scales cycloid, throughout the body. Lateral line with 47–50 branched tubes plus 4–5 on base, 7 scales in transverse series from origin of dorsal to lateral line and 9 scales from origin of anal to lateral line. Pectoral axilla with a soft and scaly sheath. Soft dorsal and anal covered with small scales. Predorsal with 35–40 scales. 18 scales around caudal peduncle.

Color in formalin uniformly dark throughout the body except thoracic region which is pale and sprinkled with brown dots. Spinous dorsal black terminally. Other fins dusky, concentrated terminally.

Described from five specimens from Keelung, and Tainan, ranging from 173 to 193 mm in total length and 146 to 168 mm in standard langth. This fish is common at the fish markets in south coast of Taiwan.

Otolithes Oken

Otolithus Cuvier, 1829, p. 172. (Type species *Johnius ruber* Bloch, by subsequent designation of Gill, 1861, p. 80).

Otolithes Oken, 1817, p. 1782. (Type species *Johnius ruber* Bloch by monotypy) (On Les *Otolithes* Cuvier, 1817, p. 299).

Body elongated, oblong or elliptical, compressed. Head moderate Snout usually somewhat pointed. Eyes moderate or small, advanced in head. Maxillary nearly or quite slips below preorbital. Mouth oblique, wide, terminal. Closed lower jaw longer, projects beyond upper. Bands of villiform teeth in both jaws, outer premaxillary row enlarged. Usually distinct canines in both jaws, of ten only in upper, when received in pits in opposite jaw. Lower jaw with single row of well spaced teeth and a single outer villiform row. Preopercle weakly denticulated in young, often crenulate to smooth with age. Preorbital narrow. Gill rakers short, few, and slender. Scales moderate to small, adherent. Pores on snout, none on chin. Lateral line with tubes simply bifurcated or aborescent. Airbladder usually with lateral appendages. Pyloric appendages few.

Shore fishes of warmer Indian and Western Pacific Oceans, some reaching a large size, and ascending rivers. (Fowler)

Otolithes argenteus Kuhl and Van Hasselt

Otolithus argenteus Kuhl and Van Hasselt, in Cuvier, 1830, p. (47) 62 (type locality: Batavia, Java; Malabar; Malacca)._____Richardson, 1846, p. 225 (Canton)._____Günther, 1860, p. 310 (China)._____Bleeker, 1865, p. 56 (Amoy); 1873, p. 141 (Canton; Amoy).____ Jordan and Eigenmann, 1886 (1889), p. 346 (Hong Kong)._____Chu, 1931, p. 136 (compiled)_____Fowler, 1949 p. 7, fig. 69 (compiled)._____Umali, 1937, p. 234,(San Miguel Bay, Luzon)

Otolithes argenteus Lin, 1935, p. 5, fig. 2 (Swatow); 1938, p. 41 (Swabue). Tang, 1937, p. 49 (Amoy). _____Herre and Myers, 1937, p. 30 (Penang).

Body elongate and compressed, its greatest thickness 1.48 in its greatest depth. Dorsum rising upward about an angle of 10 to the body axis from snout tip to origin of soft dorsal, slightly concave over eye; origin of soft dorsal is the highest point, from where the dorsum sloping downward to base of end of dorsal. Upper edge of caudal peduncle concave. Venter more arched than dorsum. Head moderate. Eye above and anterior, its lower margin below horizontal through commencement of gape of mouth. Mouth oblique with upper jaw oblique and lower jaw projecting even in closed mouth. Maxillary concealed under preorbital sheath except a small portion at its hind angle, extending nearly to middle of pupil. Snout flatly rounded, without pores. Nostrils two, anterior one small and rounded, posterior one oval, close to eye. Mandible without pores at chin. Two strong, curved inward canines at front end of upper jaw, with two small canines between them, widely set, and a series of small canines behind. Lower jaw with a single strong canine at symphysis; and small, conical and pungeant teeth on sides. Vomer and palate toothless. Tongue short, with rounded free tip. Preopercle feebly denticulated. Opercle with two flat spines, lower one longer. Gill rakers 4–5+9–10, extreme one rudimentary, longest one 1.50–1.65 in filament which is 10–11 in head.

Head 3.58–3.75, greatest depth 4.18–4.38 in standard length. width of head 1.91, height of head 1.55, least depth of caudal peduncle 3.39–3.34, horizontal diameter of eye 5.25, interorbital distance 3.08–3.70, postocular portion of head 1.72–1.80, in head. Distance from snout tip to origin of dorsal 3.08–3.35, to origin of pelvics 3.01–3.28, to origin of anal 1.36–1.42. Least depth of caudal peduncle 2.50–2.59 in its lenghth which is 1.31–1.35 in head.

D. X/I/27, first dorsal spine short, third and fourth spine longest, 2.14–2.36 in head. Anal II,7 second spine slender and weak, 4.38–5.15 in head, half as long as first anal ray which is 2.28–2.62 in head. Origin of anal opposite 13–14th dorsal ray. Pectoral 17, falciform, its longest ray 1.35–1.50 in head. Pelvics I, 5, its longest ray 1.69–1.88 in head. Caudal cunneate, 17, its longest ray 1.60–1.78 in head.

Scales cycloid. Lateral line parallel with dorsal profile, with 47–49 branched tubes plus two to three on caual base. Soft dorsal with a basal sheath, anal similar. Pectoral axilla with a scaly and soft sheath. Predorsal scales small, about 45 to 50, to tip of snout. 7 1/2 scales in transverse series from origin of dorsal to lateral line and 8 1/2 scales in transverse series from origin of anal to lateral line. 16–17 scales around caudal peduncle.

Coloration: a little dark on back just above level of pectoral fin, yellowish white on ventral portion. Opercle with a dark blotch. Spinous dorsal black terminally. Soft dorsal and caudal dusk terminally. Other fins white. A black on inner base of pectoral fin.

Described from two specimens 220 and 226 mm in total length and 188–197 mm in standard length collected at Pingtung, south coast of Taiwan on August 6, 1955. This species is only seen in the markets of the south coast.

Miichthys Lin, 1938

Miichthys Lin, 1938, p. 165. (Type species *Sciaena mi-iuy* Basilewsky by monotypy).

Body oblong, compressed. Head small and tapering. Snout slightly overhanging upper jaw, with a pore above rostral margin which is not incised. Four pores on chin. Teeth in upper jaw of two series, outer series enlarged, front pairs in strong canine, inner series in villiform band; lower jaw of two series, inner series strong, enlarged and canine-like, outer series villiform. Preopercle crenulate. Lower gillrakers 8–10. Vertebrae 24 to 25. Scales on anterior part of head cycloid, elsewhere ctenoid. D. IX/I/28–30. A. II, 7, second spine weak and slender. Basal sheath of dorsal and anal entirely of small cycloid scales. One third of soft dorsal and anal covered by small cycloid scales. One species known.

Common food fish in waters north of this island.

Miichthys mi-iuy (Basilewsky)

Sciaena mi-iuy Basilewsky, 1855, p. 22 (type locality: Maridiano; Pekiang).

Otolithus? mi-iuy Bleeker, 1873, p. 41 (reference).

Nibea Mi-iuy Wang, 1935, p. 446, fig. 31 (Chefoo, Shangtung).

Miichthys mi-iuy Lin, 1938, p. 166 (Chusan; Shanghai).

Pseudosciaena mi-iuy Herre, 1945, p. 117 (Tinghai, Chusan Island).

Corvina amoyensis Bleeker, 1873, p. 142 (reference).

Johnius amoyensis Reeves, 1927, p. 10 (reference)._____Chu, 1931, p. 134 (reference)._____Fowler, 1933, p. 371 (compiled).

Corvina japonica Lin, 1935. p. 11, fig. 6 (Chusan; Shangtung).

Pseudosciaena japonica Tang, 1937, p. 67 (Shanghai; Amoy).

Pseudosciaena mi-iuy Herre, 1945 p. 117 (Chusan)

Nibea imbricata Matsubara, 1937, p. 38, fig. 8 (China Sea)._____Liang, 1951. p. 26 (No locality)_____Chen, 1952, p. 330 (ref.).

Body oblong, compressed, its greatest thickness of body 1.85–2.00 in its greatest depth. Dorsum rising upward about an angle of 30 to body axis from snout tip to origin of dorsal, thence arched a little to origin of soft dorsal from where the dorsal profile sloping downward to base of end of dorsal. Upper edge of caudal peduncle concave to the base of caudal. Venter nearly straight. Head small and tapering. Eye moderate, anterior and above, its lower margin far above horizontal through commencement of gape of mouth. Mouth terminal and lower jaw included in closed mouth. Maxillary concealed under preorbital sheath and exposed only its hind portion, reaching beyond posterior border of eye. Snout a little rounded, slightly overhanging upper jaw, with a distinct pore just above rostral margin which is not incised. Nostrils two, anterior one smaller and rounded, posterior one crescent, close to eye. Lips thick, fringed along the edge of teeth. Four pores on chin, anterior pair small and rounded, posterior pair

slit-like. Teeth of upper jaw in two series, outer series enlarged, especially front pairs which are strong canines, inner series villiform; Lower jaw of two series, inner series strong, enlarged, canine-like and distantly set, about 7–8 on each side, outer series villiform and close-set. Vomer and palate toothless. Tongue short, with rounded free tip. Preoperle edge weakly denticulated. Opercle with two flat spines, not extending beyond gill membranes. Posttemporal ciliate. Gill rakers 5-7+8-10, extreme ones rudimentary, the longest a little longer or as long as filament which is 9.67-11.2 in head.

Head 3.46–3.59, greatest depth 4.12-4.41 in standard length. Width of head 1.91–2.10, height of head 1.41–1.56, least depth of caudal peduncle 3.64–3.81, horizontal diameter of eye 4.96 5.87, interobital distance 4.29-4.82, snout 4.00–4.35, postocular 1.60–1.69 in head. Distance from snout tip to origin of dorsal 3.01–3.28, to origin of pelvics 3.19–3.44, to origin of anal 1.32-1.51 in standard length. Least depth of caudal peduncle 3.05–3.35 in its length which is 1.09–1.25 in head.

Dorsal IX/I/28–30, first spine short, third and fourth spine longest. Anal II, 7, first spine nearly imbedded, second spine weak and slender about half as long as the first anal ray which is 2.25–2.36 in head. Origin of anal opposite 11th soft dorsal ray. Pectoral falciform, 21–22, its longest ray 1.49–1.57 in head. Pelvics I, 5, its longest ray 1.76–1.95 in head. Caudal cunneate, 17, its longest ray 1.19–1.37 in head.

Scales on snout, preorbital, anterior part of head, cheeks cycloid, elsewhere ctenoid. Lateral line with 50–52 branched tubes plus 4-5 on caudal base. One third up the soft dorsal and anal covered by small, cycloid scales. 8–9 Scales in transverse series from origin of dorsal to lateral line and 9-10 scales from origin of anal to lateral line. Pectoral axilla with a soft and scaly sheath. Predorsal with 50-60 smaller scales, 18–22 scales around caudal peduncle.

Uniformly slate-dark throughout, a little paler on ventral portion. Distal part of spinous dorsal black. Soft dorsal black terminally, also with a brown spot on middle of each ray, thus forming a series of black spots. Other fins dusk, concentrated terminally. Each scale with a brown mark at base forming an oblique line across lateral line to edge of dorsal profile. Pectoral axilla with a dark blotch. Opercle with a dark blotch.

Described from four specimens from Keelung, ranging from 353 mm to 580 mm in total length and 284 mm to 485 mm in standard length. This species is common in the fish markets at Keelung and Taipei, and is a component of the so-called Min Croakers.

Pseudosciaena Bleeker

Pseudosciaena Bleeker, 1863, p. 142 (Type species *Pseudosciaena amblyceps* Bleeker by subsequent designation of Jordan, 1919).

Body oblong, compressed, tail usually slender. Head large. Mouth terminal, wide, well inclined, closed jaws equal, but when mouth opens lower jaw projects. Lips thin, smooth, with fringed edge between teeth. Maxillary protractile. Upper jaw with band of villiform teeth, outer series enlarged; mandible with tip forming knob, with small patch of irregular subequal teeth. No canines. Preopercle edge serrated. Opercle ends

in single blunt, flat spine. Lower gill rakers 18 to 20. Pseudobranchiae present. Branchiostegals 7. Occipital bony ridge always present in young to 90 mm. long, obsolet with age. Vertebrae 26 to 29. Head partly covered with cycloid scales, strongly ctenoid on body. Golden dermal glandular organs present below lateral line, one below each scale. Lateral line well arched anteriorly and extends to tip of caudal. Mouth and abdominal cavities white or gray. Dorsal with deep notch. Second anal spine weak, begins below middle of second dorsal. Caudal wedge shaped. with median point behind.

These are the most abundant and important of coastal food fishes in Chinese and Korean waters.

KEY TO THE SPECIES OF *PSEDOSCIAENA*

1a. Vertebrae 25–26; soft anal rays usually 8; size reaching 500 mm. in length..... ..... *crocea.*

1b. Vertebrae 28–30; soft anal rays usually 9 or 10; size under 300 mm. in length..... ..... *manchurica*

Pseudosciaena crocea (Richardson)

Sciaena crocea Richardson, 1846, p. 224 (Type locality: Canton).

Pseudosciaena amblyceps Bleeker, 1863, p. 8 (Amoy)._____Lin, 1935, p. 9 (Shangtung to Kwangtung).

Pseudociaena undovittata Jordan & Seale, 1905, p. 11, pl. 6 (Hongkong).

Scaiena distincta Tanaka, 1916, p. 262 (Nagasaki market).

Othonias undovittatus Mori & Uchida, 1934, p. 14 (Tinnampo).

Pseudosciaena crocea Matsubara, 1937, p. 58 (China Sea an Huzan)._____Lin, 1938, p. 162 (Chekiang; Chusan; Fusan)._____Fowler, 1949, p. 15 (compiled)_____ Herre, 1945, p. 117 (Chusan)._____Chen, 1952, p. 330 (ref.).

Body slender, compressed, its greatest thickness 1.85–2.48 in its greatest depth. Dorsum rising upward about an angle of 30 to body axis from snout to nape. Dorsum especially at nape more curved; venter less curved. Head large and caverous; Eye anterior and above, its lower margin slightly below horizontal through commencement of gape of mouth. Interorbital space roundly convex. Mouth terminal, with upper jaw strongly oblique and lower jaw slightly projecting. Maxillary extending to or beyond posterior end of orbit. Nostrils double, close to eye. Snout rounded with four pores, upper three in a curved row over the lower median one immediately above the rostral margin. Mandible with four small indistinct pores. Teeth in two series on both jaws, inner series of upper jaw and outer series of lower jaw villiform; outer series of upper jaw and inner series of lower jaw enlarged and concial. Vomer and palate toothless. Preopercular margin feebly serrated. Opercular terminating in a single, flat spine. Gill rakers 8–11+17–20, extreme one small and short; longest as gill filament or 8.25–9.50 head. Vertebrae 26 including hypural.

Head 3.38-3.57, depth 3.60-4.36 in standard length. Width of head 2.13-2.22, least depth of caudal peduncle 3.76-4.41, horizontal diameter of eye 4.16-4.64, snout 3.89-4.25, interorbital 3.21-4.08, postocular portion of head 1.65-1.76 in head. Distance from snout tip to origin of dorsal 3.07-3.34, to origin of ventral 3.07-3.19, to origin of anal 1.32-1.43. Least depth of caudal peduncle 3.00-4.24 in its length which is 0.98-1.25 in head.

D. IX/I/32, 3rd spine longest, 2.97-3.64 in head, longest dorsal ray 2.67-3.00 in head. Anal II, 8, second spine weak, 4.36-6.12 in head, longest anal ray 1.92-2.42 in head. Origin of anal opposite 16-17th dorsal ray. Pectoral falciform, 18, its longest ray 1.24-1.54 in head. Ventral I, 5, its longest 1.51-1.65 in head. Caudal spear-shaped, with pointed tip, 18, its longest 1.14-1.21 in head.

Scales on snout, opercles, orbitals and interorbitals, soft dorsal and anal cycloid, otherwise ctenoid. Scales below lateral line larger than above. Lateral line parallel with dorsal profile, with 49-54 aborescent tubes plus 3-5 on caudal base. 8-9 scales in transverse series from origin of dorsal to lateral line, 9-10 scales from origin of anal to lateral line. 44-52 predorsal scales, 18-21 scales around caudal peduncle. Posttemporal feebly ciliate.

Color yellow below, brownish gray above; spot on each scale forming oblique stripes more or less distinct above lateral line. Dorsal and caudal brown, dusk terminally. A dark blotch on upper axil of pectoral fin.

Described from four specimens ranged from 215-457 mm in total length and 172-371 mm in standard length, collected at fish markets at Keelung and Taipei.

Pseudociaena manchurica (Jordan and Thompson)

Sciaena manchurica Jordan and Thompson, 1911, p. 255 (Type locality: Port Arthur, Manchuria)._____Jordan and Metz, 1913, p. 38, fig. 28 (copied).

Othonias undovittatus Jordan and Hubbs, 1925, p. 244 (Osaka).

Pseudociaena undovittata Lin (Not of Jordan and Scale), 1935, p. 9 (Shangtung).

Pseudosciaena amblyceps (not Bleeker) Fowler, 1933, p. 369 (part)

Pseudosciaena manchurica Matsubara, 1937, p. 59 (Fusan; China Sea)._____Lin, 1938, p. 164 (Tsingtao, Manchuria, Chosen, Shangtung, Kiangsu, Chekiang)._____ Herre, 1945, p. 117 (Tinghai, Chusan I; Tsingtao, Shagtung)._____Fowler, 1949, p. 17, (compiled).

The adult fish of the present species is much like the young stages of *P. crocea* in most characters. To the inexperienced eyes, it is rather difficult to distinguish these two species, although the adult fish of *crocea* is easy to recognize. On hand were four specimens of the present species, 237-264 mm. in total length and 188-210 mm in standard length. Since its meristic characters resemble those of *crocea*, the description in detail is here omitted. According to Matsubara in 1937, theses two species are distinguished one from the other by the following four items:

1) Number of vertebrae: there are 29 (28-30) vertebrae in *manchurica*, and 25 (sometimes 26) in *crocea*.

2) The second anal spine is longer in *crocea* than in *manchurica*. In the former, it is 4.00 to 6.00 in head and usually longer than diameter of eye. In the latter, it is 5.00 to 8.00 in head and always much shorter than diameter of eye. However, it is not true to some extent in the specimens examined.

3) Number of soft anal rays: *P. crocea* usually possesses 8 rays and rarely 7 or 9 rays, but the other is always provided with 9 or 10 rays.

4) Body length: *P. crocea* usually reaches more than 500 mm in body length, but mostly less than 300 mm in body length in *P. manchurica*.

Argyrosomus de la Pylaie

Argyrosomus de la Pylaie, 1834 (1835), p. 534 (Type species: ***Labrus hololepidotus*** La Cepdede, by monotypy).

Body oblong, compressed. Head bluntly pointed. Snout broadly rounded, with 3 large pores on margin. Jaws equal in front, mouth cleft rather wide. Premaxillary with villiform band of small, short teeth, outer series enlarged, become conical and slightly curved backward; lower teeth biserial, inner rows enlarged, conic, wide set. Preopercle edge crenulate or without distinct spines. Posttemporal small, faintly fimbriate. Gill rakers stout, short. Branchiostegals 7. Vertebrae 24–26. Scales cycloid on snout and cheek, otherwise on head and body ciliated. Dorsal spines 10, second fin with spine and 23–33 rays. Anal spines 2, rays 7, second spine moderate or 4 in head. Caudal truncate or cuneate. (After Fowler).

KEY TO THE SPECIES OF *ARGYROSOMUS*

1a. Mouth cavity black; lower margin of eye far below horizontal through commencement of gape of mouth ..... ***nibe***.

1b. Mouth cavity white; lower margin of eye passing through or above the horizontal through commencement of gape of mouth.

2a. Head large, 2.69–2.94 in standard length; scales on anterior body cycloid; Posterior nostril usually semi-circular in shape; Opercles without distinct blotch on living specimens ..... ***macrocephalus***

2b. Head moderate, over 2.90 in standard length. scales on anterior body weakly or moderately ciliate. Posterior nostril ovate; Opercles with distinct blotch in life.

3a. Caudal truncate or biconcave, at least with age; size larger; eye small, more than 6 in head ..... ***japonicus***

3b. Caudal cunneate at all stages; size smaller or moderate; eye moderate, usually under 5 in head.

4a. Spinous dorsal with black blotch between 7th and 10th spines. Body usually with a dark broad longitudinal band on side of tail. Soft dorsal rays always 24 ..... ***pawak***

4b. Spinous dorsal without black blotch. Body without a dark broad longitudinal band on sides of tail. Dorsal rays usually 26–30 ..... ***argentatus***

Argyrosomus nibe (Jordan and Thompson)

Sciaena nibe Jordan and Thompson, 1911, p. 258, fig. 4 (type locality, Wakanoura, Japan).——Böhlke, 1953, p. 79 (paratypes).

Nibea niba Reeves, 1928, p. 10 (Korea).——Lin, 1935, p. 19, fig. 10 (Chusan).——Matsubara, 1937, p. 52 (China Sea).——Liang, 1951, p. 26 (Keelung).——Jordan & Hubbs, 1925, p. 243 (Osaka, Mikawa).

Pseudosciaena nibe Tang, 1937, p. 67 (Foochow).

Johnius nibe Fowler, 1938, p. 31 (Macao).

Argyrosomus nibe Lin, 1938, p. 367 (Chusan).——Herre, 1945, p. 118 (Tinghai, Chusan Island).——Fowler, 1949, p. 24 (compiled).——Chen, 1952, p. 330 (ref.).

Pseudolithus brunneolus Jordan and Richardson, 1909, p. 191, pl. 7 (type locality, Takao=Kaohshiung, Formosa).——Böhlke, 1953, p. 78 (Syntype).

Body oblong, compressed, its greatest thickness 1.69–1.94 in its greatest depth. Dorsum rising upward about an angle of 20–30 to body axis from snout tip to origin of soft dorsal which is the highest point, thence sloping downward to base of end of dorsal. Upper edge of caudal peduncle concave. Venter less arched as dorsum. Head large and triangular. Eye large, anterior and above, its lower margin below the horizontal through the commencement of gape of the mouth. Mouth terminal with upper jaw oblique and lower jaw as long as upper. Maxillary largely concealed under preorbital sheath, exposed only its hind angle, extending to middle or hind border of eye. Interorbital space broad, slightly convex. Snout blunt, with four pores, upper three in a curved row over the lower median one immediately above rostral margin which is not incised into lobes. Nostrils double, anterior one ovate, posterior one slit-like, close to eye. Lips thick, fringed along the edge in contact with teeth. Mandible with six small pores at chin. Teeth of upper jaw in two series, outer series enlarged, especially three pairs in front, strong and canine-like, inner series villiform; lower jaw in two series, inner series of large and conical teeth, becoming larger and distantly set on lateral and behind, outer series villiform. Tongue short, with free tip. Vomer and palate toothless. Preopercle only denticulated at angles. Opercles with two flat spines with equall length. Posttemporal ciliate. Gill-rakers 6–7+11–15, lower one to four rudimentary, its longest a little longer than filament, or 2.00–2.50 in eye or 7.00–12.50 in head.

Head 3.00–3.30, greatest depth 3.24–3.68 in standard length. Width of head 2.11–2.28, height of head 1.35–1.50, least depth of caudal peduncle 3.29–3.70, horizontal diameter of eye 3.40–4.35, interorbital 3.40–4.22, snout 3.40–4.06, postocular 1.93–2.00 in head. Distance from snout tip to origin of dorsal 2.81–2.99, to origin of ventral 2.79–3.01, to origin of anal 1.35–1.41 in standard length. Least depth of caudal peduncle 2.38–2.50 in its length which is 1.37–1.50 in head.

D. X/I/28–31 usually with 29–30 rays, first spine short, third and fourth longest, 2.55–2.82 in head; first dorsal ray longest, 2.70–3.37 in head. Anal II, 7, second spine slender, about half as long as the first anal ray which is 2.35–2.82 in head. Origin of

anal opposite 10th–13th dorsal ray. Pectoral fin falciform, 15–17, its longest ray 1.25–1.37 in head. Ventral I, 5 its longest ray 1.80–2.19 in head. Caudal cunneate, with middle rays elongated, its longest ray 1.20–1.35. in head.

Scales cycloid on opercles, snout, cheeks elsewhere ciliate. Lateral line parallel with dorsal profile with 50–51 arborescent tubes plus 3–5 on base. 6–8 scales in transverse series from origin of dorsal to lateral line and 8–9 scales from origin of anal to lateral line. 25–33 predorsal scales. 18 scales around caudal peduncle.

Dark gray above, silvery below. Buccal and opercular cavities black. Opercular blotch not distinct. Spinous dorsal black terminally. Pectoral, anal, caudal and soft dorsal dusk. Pectoral axilla with a distinct dark spot.

Described from nine specimens ranging from 185 to 380 mm in total length collected in the fish markets at Keelung, Tung Kong and Kaohsung. It is the most abundant Sciaenoid fish in coastal waters especially north of this Island.

Argyrosomus macrocephalus (Tang)

Pseudosciaena macrocephalus Tang, 1937, p. 70, pl. 1, fig. 2 (type locality: Amoy) (*Pagrus macrocephalus* Basilewsky 1855 not involved).

Argyrosomus macrocephalus Lin, 1940, p. 250, fig. 4 (Hong Kong)._____Fowler, 1949, p. 27 (compiled).

Corvula argentata (not Houttuyn) Jordan and Evermann, 1902, p. 351 (Formosa)._____Jordan and Richardson, 1909, p. 191 (copied).

Argyrosomus argentatus Chen, 1952, p. 330 (ref.).

Nibea schlegeli Liang, 1948, p. 15 (Pescadore Islands)

Body oblong, compressed, its greatest thickness 1.83–2.22 in its depth. Dorsum rising upward about an angle of 20–30 to body axis from snout tip to origin of dorsal, thence sloping downward to base of end of dorsal. Upper edge of caudal peduncle concave. Venter less arched. Head large. Eye anterior and above, its lower margin above horizontal through commencement of gape of mouth. Mouth terminal with upper jaw strongly oblique and lower jaw slightly projecting beyond uppor jaw. Interorbital broad and convex. Maxillary reaching nearly to hind border of eye. Snout flatly rounded with four small pores, upper three indistinct in a curved row above the lower median and distinct one, rounded, immediately above rostral margin which is not incised into lobes. Mandible with six small pores at chin, posterior pair in indistinct slits, anterior pairs small, rounded and indistinct. Nostrils double, anterior one rounded and small, posterior one large and semicircular, close to eye. Teeth of upper jaw in two series, inner series in villiform band and outer series distantly set, enlarged and conical; lower jaw in two series, inner series enlarged, stronger posteriorly, and outer series villiform. Symphysis of upper jaw provided with a very shallow emargination to receive the small blunted symphysical knob of the mandible. Vomer and palate toothless. Tongue with a free rounded tip. Preopercle crenulated, stronger at angles. Operculum terminating in two flat spines, not extending beyond gill membrane. Gill

rakers 5-6+13-16, upper one or two and lower two or five rudimentary, the longest one 1.5 times longer than filament or 7-9 in head.

Head 2.69-2.04, greatest depth 3.08 in standard length. Width of head 2.12-2.69, height of head 2.05-1.20, least depth of caudal peduncle 3.26-3.92, horizontal diameter of eye 3.97-4.50, interorbital distance 3.52-3.95, snout 3.08-3.86, postocular portion of head 1.72-1.89 in head. Distance from snout tip to origin of dorsal 2.49-2.89, to origin of ventral 2.58-2.66, to origin of anal 1.26-1.34 in standard length. Least depth of caudal peduncle 1.58-2.29 in its length which is 1.71-2.06 in head.

D. IX-XI/I/23-30, first dorsal with average of X spines and second dorsal with 27.7 dorsal rays from 86 specimens examined, third spine longest, 2.19-2.90 in head; first dorsal rays longest, 2.86-3.59 in head. A. II, 7-9, usually with seven rays. Second anal spine 2.92-3.59 in head, its first ray 2.40-2.71 in head. Origin of anal opposite the 11th-13th dorsal ray. Pectoral 16-17, falciform, its longest 1.31-1.52 in head. Ventral I, 5, its longest 1.50-1.89 in head. Caudal cuneate, 18, its longest 1.15-1.36 in head.

Scales large, cycloid on head and anterior portion of body, weakly ciliate on posterior half of body. Lateral line arched as dorsal profile, with 41-47 arborescent tubes, plus 4-6 on caudal base. 6-8 scales in transverse series from origin of dorsal to lateral line and 7-9 scales from origin of anal to lateral line. Soft dorsal and anal with a basal sheath of two rows of cycloid scales. 34-43 predorsal scales. 18-19 scales around caudal peduncle.

Body pale white above and silvery white below. Opercle blotch indistinct in life. A small black speck at pectoral axilla. Spinous dorsal black terminally. Soft dorsal and caudal slightly dusky terminally. Other fins white. Mouth cavity white. Gill cavity black.

Described from 97 specimens from Keelung and Taipei. This species is the most abundant Sciaenoid fish in the Strait of Taiwan. Its total length is 113 to 259 mm, with an average of 201.5 mm and its standard length is 89-214 mm, with an average of 164.5 mm. This species differs from *argentatus* in having a larger head.

Argyrosomus japonicus (Schlegel)

Sciaena japonica Schlegel, 1843, p. 58, pl. 24, fig. 1 (type locality: south west coast of Japan).

Nibea japonica Matsubara, 1937, p. 41, fig. 9-10 (Tokyo).

Argyrosomus japonicus Lin, 1938, p. 170 (Chusan, Chekiang). ——— Herklots, 1940, p. 46, fig. (Hongkong). ——— Lin, 1940, p. 244, fig. 1 (Hong Kong). ——— Fowler, 1949, p. 22, fig. 73 (compiled)

Body oblong, compressed, its greatest thickness 1.70-1.82 in its greatest depth. Dorsum rising upward about an angle of 30 to the body axis from snout tip to origin of dorsal, thence running smoothly to origin of soft dorsal, from where the dorsum sloping downward to the base of end of soft dorsal. Head pointed. Eye small, anterior and above, its lower margin just coincident with horizontal through commencement

of gape of mouth. Mouth moderately oblique, terminal in closed mouth. Maxillary concealed under preorbital sheath except posterior dilated upper angle, extending to hind border of pupil. Snout broadly rounded with a distinct pore on rostral margin which is not incised. Nostrils two, posterior one larger, ovate and elongated, close to front eye border. Mandible with six small pores on chin, posterior two being slits. Teeth of upper jaw in two series, inner series in villiform band, outer series of distant, conical and caninoid teeth. Mandibular teeth of two series, inner series enlarged, widely set and conical; outer series small and closely set. Vomer and palate edendate. Tongue short, with rounded free tip. Preopercle weakly denticulated on upper and lower limbs, becoming larger and more widely set at the angles. Gill rakers 4+5+9, extreme one rudimentary, longest 1.10 in filament in a younger specimen. 2.0 in older specimen; the longest gill filament 11–13 in head.

Head 3.40–3.67, greatest depth of body 4.00–4.38 in standard length. Width of head 1.79–2.25, height of head 1.35–1.50, least depth of caudal peduncle 3.41–3.14, horizontal diameter of eye 6.74–7.68, interorbital distance 3.33–4.30, snout 3.63–3.70, postocular 1.64–1.66 in head. Distance from snout tip to origin of dorsal 2.98–3.29, to origin of ventral 3.03–3.04, to origin of anal 1.34–1.46, least depth of caudal pedunncle 2.78–2.98 in its length which is 1.15–1.23 in head.

Dorsal X/I/27, first dorsal spine short, third spine longest, 2.36 in head; first dorsal ray longest, 2.95–3.41 in head. Anal fin II, 7, first spine short, second spine 3.72–3.77 in head or 1.64–1.73 in first anal ray which is 2.34 in head. Origin of anal opposite 11th–12th dorsal ray. Pectoral 16, lanceolate, its longest ray 1.69–1.89 in head. Pelvics I, 5, its longest ray 1.85–1.89 in head. Caudal truncate in older specimen and biconcave in younger specimen, 17, its longest ray 1.43–1.86 in head.

Scales on snout, preorbital and anterior part of cheek cycloid, otherwise ciliate. Soft dorsal with a basal sheath of one row, anal similar, caudal up to half of the fin. Lateral line running parallel with dorsal profile, slightly arched, with 50 arborescent tubes plus four on caudal base. Pectoral with a soft and scaly sheath. Predorsal scales 58–61. 18 scales around caudal peduncle. Posttemporal distantly denticulated.

Dark gray above, pale below on young specimen and dark throughout in older specimen (except on ventral portion). All fins black terminally. Operculum with indistinct blotch in younger specimen and void in older specimen. Pectoral axillary sheath black.

Two specimens of 790 and 481 mm in standard length, and 885 and 581 mm in total length from fish markets at Keelung and Taipei. This species is rather common in the Strait and east coastal water of Taiwan and forms one of the so-called Min Croakers.

Argyrosomus pawak Lin

Argyrosomus pawak Lin, 1940, p. 248, fig. 3 (type locality: fishing grounds of Hong Kong).——Fowler, 1949, p. 25 (compiled).

Body oblong, compressed, its greatest thickness 1.77–2.10 in its greatest depth. Dorsum rising upward about an angle of 30 to body axis from snout to origin of dorsal. Dorsal and ventral profile nearly equal or the former more curved. Head moderate. Eye anterior and above, its lower margin above horizontal through commencement of gape of mouth. Mouth terminal, with upper jaw oblique and lower jaw a little included in closed mouth. Maxillary concealed under preorbital sheath, only its hind portion exposed, extending nearly to hind border of pupil. Interorbital convex. Snout rounded with four pores, upper three in a curved row over the lower median one immediately above rostral margin which is not incised. Nostrils double, ovate, close to eye. Mandible with six pores. Teeth of upper jaw in two series, outer series enlarged, conical and distantly set, inner series in villiform band. Lower jaw in two series, inner series enlarged, outer series villiform, 3 or 4 rows near symphsis, one or two posteriorly. Vomer and palate toothless. Tongue short, with rounded free tip. Preopercle feebly denticulated at angles. Opercle ending in two soft points, the upper smaller. Gill rakers 5-6+19, upper one or two and lower one rudimentary, its longest 1.20–1.86 in filament which is 7.78–9.75 in head. Vertebrae 25.

Head 3.02-3.14, depth 3.19-3.44 in standard length. Width of head 2.14–2.39, height of head 1.20-1.25, least depth of caudal peduncle 3.24-3.66, horizontal diameter of eye 3.86–4.18, snout 2.69-3.12, interorbital 3.38–3.93, postocular portion of head 1.59–1.95 in head. Distance from snout tip to origin of dorsal 2.80-2.88, to origin of ventral 2.73-2.86, to origin of anal 1.33–1.36 in standard length. Least depth of caudal peduncle 2.10–2.26 in its length.

D. X/I/24, third spine longest, 2.39–2.93 in head, first dorsal ray longest 3.60–3.67 in head. Anal II, 7, second spine weak, half as long as the first ray which is 2.82–3.16 in head. Origin of anal opposite the 11th dorsal ray. Pectoral falciform, 18, its longest 1.66–1.77 in head. Ventral I, 5, its longest ray 2.01–2.08 in head. Caudal biconcave, 17, its longest 1.52–1.65 in head.

Scales cycloid on cheeks and opercles, elsewhere ciliate. Soft dorsal naked with a basal sheath of one row of scale. Anal entirely naked. Lateral line parallel with dorsal profile, with 46–51 branched tubes, plus 5-6 on caudal base. 7 scales in transverse series from origin of dorsal to lateral line and 8 scales from origin of anal to lateral line. 37–42 predorsal scales. 17–18 scales around caudal peduncle. Posttemporal ciliate.

Coloration dark gray above level of pectoral, silvery white below. In formalin a dark band running in the middle of tail. Dark opercular blotch. Spinous dorsal dark throughout, with a distinct black marking in the space between 7th and 10th spine; soft dorsal brownish with a broad longitudinal white band in middle. Caudal fin dusk terminally. Other fins white.

Described from four specimens of 199–232 mm. in total length and 163.5–194.5 mm. in standard length. They were collected from fish market at Keelung, and were caught in the South China Seas by trawling.

Argyrosomus argentatus (Houttuyn)

Sparus argentatus Houttuyn, 1782, p. 320 (Type locality: Nagasaki).

Corvina sina Temminck and Schlegel, 1843, p. 58, pl. 24, fig. 2: Nagasaki, bays of southwest coast of Japan).___Bleeker, 1857, p. 82 (Nagasaki). (Not *Corviua sina* of Cuvier and Valenciennes,).

Pseudosciaena schlegeli Bleeeker, 1879, p. 9 (Nagasaki, Yedo after Temminck and Schlegel).

Nibea schlegel Jordan and Hubbs 1925, p. 243 (Japan)

Sciaena schlegeli Steindachner and Doderlein, 1883, p. 33 (Tokyo)_____Jordan and Thompson, 1911, p. 254 (Southern Japan).

Nibea argentata Matsubara, 1937, p. 44 (China Sea, Simabara, Miya, Huzan, and Siogama).

Corniva schlegeli Jordan and Snyder, 1901, p. 81 (Yokohama).

Argyrosomus argentatus Lin, 1938, p. 368 (Shangtung: Fusan)_____Fowler, 1949, p. 26 (Compiled)

Pseudosciaena indicus Tang, 1937, p. 64 (Foochow).

Argyrosomus indicus Lin, 1940, p. 252, fig. 5. (Hong Kong),_____Fowler, 1949, p. 27 (Compiled).

Body oblong, compressed. its greatest thickness 2.00–2.31 in its depth. Dorsum rising about an angle of 40 to body axis from snout tip to origin of dorsal, thence slightly curved to origin of soft dorsal, thence sloping downward to the base of end of dorsal. Upper edge of caudal peduncle concave. Venter nearly straight before anal. Head moderate. Eye anterior and above, its lower margin far above horizontal through commencement of gape of mouth. Mouth terminal, with upper jaw a little oblique and lower jaw included in closed mouth. Maxillary exposed only its hind portion, extending nearly to hind border of eye. Snout rounded with four pores, upper three in a curved series above the median one immediately above the rostral margin which is slightly incised. Nostrils double, anterior one small and rounded, posterior one oval, close to orbit. Mandible with six small pores, posterior pores slit-like. Teeth of upper jaw in two series, outer series enlarged, widely set and slightly canine-like; inner series villiform; mandible in two series, the inner series enlarged, outer series villiform. Vomer and palate edentate. Tongue short, with rounded free tip. Preopercle weakly denticulated only at the angle. Gill rakers 5–6+8–11, upper one or two and lower two rudimentary, the longest as long as filament, which is 10 to 12 in head.

Head 2.90–3.23, greatest depth of body 2.98–3.32 in standard length. Width of head 2.16–2.52, height of head 1.20–1.24, least depth of caudal peduncle 3.11–3.60, horizontal diameter of eye 3.74–4.84, interorbital space 3.49–400, snout 3.18–3.49, postocular 1.84–1.90 in head. Distance from snout tip to origin of dorsal 2.62–2.92, to origin of ventral 2.61–2.91, to origin of anal 1.30–1.41 in standard length. Least depth of caudal peduncle 2.25–2.51 in its length which is 1.24–1.60 in head.

D. X/I/26–29, with an average of 27.3, third spine longest, 2.07–2.84 in head; dorsal

ray 2.47–3.23 in head. A. II, 7–8, always 7; second spine 3.28–4.03 in head or about half long as first anal ray which is 2.11–2.52 in head. Its origin opposite 11th dorsal ray. Pectoral falciform, 16–18, its longest ray 1.32–1.50 in head. Ventral I, 5, its longest ray 1.53–1.68 in head. Caudal cunneate, 17–18, its longest ray 1.30–1.49 in head.

Scales on snout, suborbitals, opercles cycloid, elsewhere weakly ciliate. Soft dorsal with a basal sheath of one row, anal similar, caudal to one fourth up the fin. Lateral line with 48–50 branched tubes, plus four on caudal base. 18 scales in transverse series from origin of dorsal to lateral line and 9 scales from origin of anal to lateral line. Pectoral with a soft scaly sheath on axilla. 40–50 predorsal scales. 18–20 scales around caudal peduncle.

Color in formalin yellowish white above. silverly white below. Opercle with a dark blotch. Spinous dorsal dusky and narrowly black on its edge. Soft dorsal with a narrow milky white band on middle, with distal part dusky, and basal part darkly spotted. Caudal black terminally. Other fins white. Pectoral axilla with blackish dots on inner bases of rays.

Described from 41 specimens from 178 to 325 mm in total length (average 225.3) and 143–288.4 mm. in standard length, collected at Keelung.

The present species is usually caught in small quantity by trawling in the south china seas and Taiwan Strait, but is abundant in the south Japanese seas. Tang's *Pseudosciaena indicus* or Lin's *A. indicus* is the young form of this species.

Johnius Bloch

Johnius Bloch, 1793, p. 132 (Type species *Johnius carutta* Bloch, by subsequent designation of Gill, p. 85.)

Body oblong, compressed. Head blunted. Eye anterior and above. Mouth oblique and lower jaw included. Maxillary except hind portion, concealed under preorbital sheath, extending to middle of eye. Snout rounded with four pores on tip, with rostral margin lobated. Mandible with five distinct pores. Teeth of upper jaw in two series, outer series enlarged, inner series in villiform band. Preopercle feebly denticulated. Gill-rakers 4–5+11–14, short. Dorsal fin with 11 spines and 27–31 rays. Anal with 2 spines and seven rays; second spine half as long as first anal rays. Scales cycloid on head, feebly ciliate on body. Soft dorsal and anal covered with small, cycloid scales nearly to edge. Lateral line parallel with dorsal profile, with 48–53 branched tubes, plus two or four on caudal base. Caudal cunneate.

Shore fishes of tropical and subtropical seas, in the Indian Ocean, Indo-Australian Archipelago, Philippines, China and Australia. Two species have been found to inhabitate the coastal waters of this Island. *Johnius carutta* is the third one of the most abundant species in the Strait of Taiwan.

In Fowler's work in 1933, it was written that *Johnius carutta*, the type species of this genus has uniform teeth on the lower jaw. Matsubara (1937) and Lin (1938) basing

on the single species, *J. belengerii*, separated *Johnius* from *Nibea* by mandibular teeth. Lin furthermore proposed a new genus, *Wak*, for the fishes with inner teeth enlarged on lower jaw and soft dorsal scaled. On hand are two specimens of *J. belengerii*, collected at Sanmun, Chekiang, by T. Aoki in June, 1922, in which the mandibular teeth are homogeneous. Yet in our specimens of *J. carutta*, the inner series of mandibular teeth are distinctly enlarged. Moreover, Lin's *Wak tingi* is a synonym of *Johnius dussumieri*. Therefore, the character that *Johnius* differs from *Nibea* lies in the soft dorsal; in the former, it is covered with small cycloid scales, while in the latter, it is naked, with only narrow sheath on base. In view of the facts mentioned above, it is unnecessary to have a new genus *Wak* for this group of fishes.

KEY TO THE SPECIES OF *JOHNIUS*

1a. Lateral line with a shining and pale median streak or narrow band throughout its course ..... *carutta*

1b. Lateral line without a shining streak ..... *dussumieri*

Johnius carutta Bloch

Johnius carutta Bloch, 1793, p. 133, pl. 356 (type locality, Tanquebar).——Jordan and Seale, 1905, p. 11 (Hong Kong).——Reeves, 1927, p. 10, (reference), ——Tirant, 1929, p. 169 (ref.).——Fowler, 1929 (1930), p. 596 (Shanghai) 1933 (Hong Kong), p. 35, 1949, p. 35 (compiled).

Body oblong, compresed, its greatest thickness 1.79–2.13 in its greatest depth. Dorsum rising upward about an angle of 20 to body axis from snout tip to origin of dorsal, thence running smoothly, to origin of soft dorsal from where dorsum sloping downward to base fo end of dorsal. Upper edge of caudal peduncle concave to the caudal base. Venter slightly straight. Head blunted. Eye anterior and above, its lower margin above horizontal through commencement of gape of mouth. Mouth terminal, oblique, and lower jaw included. Maxillary concealed under preorbital sheath except hind portion, extending to middle of eye. Snout rounded with four pores on tip, upper three in a curved row over the lower median larger one immediately above rostral margin which is distinctly incised into two lobes. Nostrils two, in front of eye, anterior one small and rounded, posterior one larger and ovate, close to eye. Mandible with five distinct pores. Teeth of upper jaw in two series, outer series enlarged, conical, canine-like and distantly set; inner series in villiform band. Lower jaw with inner series enlarged and conical; outer series small, with three rows in front, two rows behind. Vomer and palate toothless. Tongue short, with rounded free tip. Preopercle feebly denticulated, slightly enlarged at angles. Opercles with two flat spines, lower one larger, not extending beyond gill membranes. Gill rakers minute, 4–5+11–14, except two on upper and four on lower limb, others rudimentary; longest 3–4 in gill filament, which is 2.00–2.50 in eye or 11.0–13.0 in head.

Head 3.13–3.27, greatest depth of body 3.05–3.87 in standard length. Width of head 1.74–2.14, height of head 1.27–1.31, least depth of caudal peduncle 2.91–3.35, horizontal diameter of eye 4.72–6.25, interorbital distance 3.38–3.76, snout 3.17–3.48, postorbital 1.71–1.91 in head. Distance from snout to origin of dorsal 2.81–3.10, to origin of pelvics 2.83–3.04, to origin of anal 1.24–1.38 in standard length. Least depth of caudal peduncle 2.10–2.68 in its length which is 1.25–139 in head.

D. X/I/27–31, usually 30, its first spine short, third and fourth longest, 2.00–2.87 in head; first ray longest, 3.23–3.44 in head. Anal II, 7, first anal spine short, second half as long as first anal ray which is 2.07–2.58 in head. Origin of anal opposite 14th dorsal ray. Pectoral falciform, 18–19, longest ray 1.32–1.58 in head. Pelvics I, 5, its longest ray 1.34–1.78 in head. Caudal 18, cunneate, its longest ray 1.31–1.62 in head.

Scales cycloid on head, feebly ciliate on body. Soft dorsal and anal covered with small, cycloid scales, nearly to tip. Lateral line parallel with dorsal profile, with 48–53 branched tubes, plus two or four on caudal base. 6 or 8 scales in transverse series from origin of dorsal to lateral line and 8 to 10 scales from origin of anal to lateral line. 30–42 predorsal scales. 18–20 scales around caudal peduncle. Pectoral axilla with a soft and scaly sheath. Posttemporal ciliate.

Dark gray on back, paler white below level of pectoral. Lateral line embraced with pale median streak or narrow band its whole length, conspicuously in alive specimens. Opercle with a black blotch. Spinous and soft dorsal black on base and terminally. Caudal dark, sprinkled with close-set spots; anal white, sprinkled with loosely-set dots. Other fins white.

Described from eleven specimens from Keelung, ranging from 212 mm to 271 mm in total length and 172 mm to 227 mm in standard length. This species is easily recognized by its shining and pale lateral line band throughout its course. Its abundance in the Strait is but next to *Argyrosomus nibe* and *A. macrocephalus* in this family.

Johnius dussumieri (Cuvier and Valenciennes)

Corvina dussumieri Cuvier and Valenciennes, 1830, p. (88) 119 (type locality: coast of Malabar)._____Bleeker, 1874, p. 49 (compiled)._____Fowler, 1933, p. 398 (Bombay, Singapore).

Johnius dussumieri Weber and Beaufort, 1936, p. 530 (Pinang; Singapore; Sumatra)._____Fowler, 1938, p. 32 (Hong Kong)._____Herre, 1945, p. 118 (Chusan)._____Fowler, 1949, p. 31 (compiled).

Pseudosciaena tingi Tang, 1937, p. 54, fig. 1 (Amoy).

Wak tingi Lin, 1938 (Chusan).

Body oblong, compressed, its greatest thickness 1.65–2.01 in its depth. Dorsum slightly concave at temporal, then rising upward to middle of spinous dorsal, thence sloping downward to base of dorsal. Upper edge of caudal peduncle concave to the caudal. Venter slightly curved. Head moderate and blunted. Eye anterior and above, its lower margin above horizontal through commencement of gape of mouth. Mouth

terminal and oblique. Maxillary reaching anterior border of pupil. Lower jaw slightly included and premaxillary canine teeth exposed in closed mouth. Lips thick, fringed along edge in contact with teeth. Snout blunted, with four pores on tip, upper three in a curved row over the lower median one immediately above the rostral margin which is deeply incised in two lobes. Interorbital space broad, slightly convex. Nostrils two, close to eye. Five distinct pores on chin. Teeth of upper jaw in two series, outer series enlarged, canine-like and nine on each side; inner series in broad villiform band; mandibular teeth subequal or gradually enlarged from outer series to inner series. Vomer and palate edentate. Tongue short, with rounded free tip. Preopercle feebly denticulated. Opercle terminating in two flexible and flat spine, the lower longer, neither of them extending beyond the gill membranes. Gill-rakers 5–6+1–11–12, very short, longest 2.52–3.50 in filament which is 8.33–9.10 in head, upper 3–4, lower 3–8 rudimentary.

Head 3.00–3.26, depth 2.89–3.32 in standard length. Width of head 1.50–1.87, height of head 1.31–1.42, least depth of caudal peduncle 3.05–3.50, horizontal diameter of eye 3.98–5.00, interorbital distance 3.33–4.12, snout 2.77–3.65, postocular portion of head 1.75–1.97 in head. Distance from snout tip to origin of dorsal 2.42–306, to origin of pelvics (ventral) 2.58, to origin of anal 1.27–1.41 in standard length. Least depth of caudal peduncle 1.89–2.16 in its length which is 1.42–1.62 in head.

Dorsal fin X/I/ 28–31, first spine short, third spine longest, 1.87–2.32 in head. Hind part of dorsal rays longest, 2.63–3.38 in head. Anal fin II, 7, second spine half long as the first anal ray which is 2.11–2.54 in head. Origin of anal opposite 13th dorsal ray. Pectoral, 18–20, its longest ray 1.50–1.84 in head. Pelvics, I, 5, its longest ray 1.79–1.97 in head, first ray filamentous, a little prolonged. Caudal fin, 18, rounded, its longest ray 1.35–1.47 in head.

Scales ctenoid except those on opercles, cheeks and interorbitals which are cycloid. Lateral line parallel with dorsal profile, with 46–49 distantly bifid tubes, plus two to four on caudal base. 8–9 scales in transverse series from origin of dorsal and 8–9 scales from origin of anal to lateral line. 34–41 predorsal scales. 18 scales around caudal peduncle. Soft dorsal and anal covered with small and cycloid scales nearly to tip. 10 rows of scales across cheek to preopercle edge. Scales with 8–12 radii, circuli fine.

Mostly slivery except on top of head, nape and back of body which are grayish brown. Each scale on back and sides with a slightly paler spot thus forming oblique streaks across lateral line, except on caudal peduncle the streaks parallel with lateral line. Spinous dorsal blackish, soft dorsal and caudal black terminally. Anal sprinkled with finely blackish spots on lower part. Pectoral whitish,with a small speck at upper corner or pectoral axilla. Inner edge of ventral fin dotted with fine spots.

Described from twelve specimens 183–257 mm in total length and 147–213 mm in standard length, collected at Tung Kong, Kaohsiung and Giran.

Nibea Jordan and Thompson

Nibea Jordan and Thompson, 1911, pp. 244, 246 (Type species: *Pseudotolithus mitsukurii* Jordan and Snyder, by subsequent designation of Jordan, 1920, p. 539.)

Body oblong, compressed. Snout prominent, bluntly pointed, with four pores at tip, upper three in transverse series and lower median one circular, immediately over rostral margin which is incised into lobes. Mouth terminal or a little inferior. Maxillary concealed mostly under preorbital sheath. Outer row of premaxillary and inner row of mandibular teeth enlarged and conicial, others villiform. Chin with five conspicuous pores and flat small tubercle usually present in median pore, but no barbel. Preopercle edge with serrae or crenulate. Opercle ends in two flat points, lower longer. Gill rakers 22 to 27 on first arch, short or moderate. Pseudobranchiae developed. Vertebrae 24-25. Scales on body ctenoid. Soft dorsal and anal usually scaleless. D. X-XI, 25-31. Anal II, 7-8, second spine weak to very strong.

Common and valued food fishes in the seas and brackish water estuaries of China and Japan. They differ from *Johnius* chiefly in having naked soft dorsal and anal, and differs from *Argyrosomus* in having unpaired pores on the chin and somewhat shorter lower jaw.

KEY TO SPECIES OF *NIBEA*

1a. Origin of anal opposite the 11-13th dorsal ray; soft dorsal ray 27-30.
  2a. Body with continuous dark oblique stripes on sides. Interorbital space wider, 3.16–4.36 in head.....*giranensis* sp. nov.
  2b. Body without continuous dark oblique stripes on sides. Interorbital space narrower, 4.30–4.98 in head.
    3a. Gill rakers slender and short, not tubercle-like; coloration on lower portion of body orange yellow in life.....*albiflora*
    3b. Most of gill rakers tubercle-like; coloaration silvey on lower portion of body.....*sina*
1b. Origin of anal opposite 6-8th dorsal ray; soft dorsal ray 22-27.
    4a. Head tapering; second anal spine not so long as half the length of the first anal ray; coloaration orange yellow in life on ventral portion of body.....*acuta*
    4b. Head not tapering; second anal spine half long as first anal ray or longer; coloration not as above; dorsal rays 22-24.
      5a. Irregular black spots on body and dorsal fins; second anal spines 1.35-1.70 in first anal ray.....*goma*
      5b. Body slate gray, without black spots; second anal spine about half long as the first anal ray.....*diacanthus*

***Nibea giranensis*, sp. nov** Pl. 4, fig. 2

赤占 tchuanchia

Body oblong, compressed, its greatest thickness 1.57-1.87 (1.76) in its greatest depth. Dorsum rising upward about an angle of 30 to body axis from snout tip to origin of dorsal, thence curved upward to middle of spinous dorsal where the dorsum sloping downward to base of end of dorsal. Upper edge of caudal peduncle concave. Venter

nearly straight. Head moderate. Eye anterior and above, its lower margin above horizontal through commencement of gape of mouth. Mouth terminal, with upper jaw oblique and lower distinctly included. Maxillary concealed under preorbital sheath, only its hind portion exposed, nearly extending to hind border of eye. Interorbital convex. Snout rounded with four pores, upper three in a curved row over the lower median one immediately above rostral margin which is deeply incised into two lobes. Nostrils double, ovate, anterior one small, close to eye. Mandible with five distinct pores, posterior four slit-like. Teeth of upper jaw in two series, outer enlarged, conical and canine-like, distantly set; inner series in villiform band; lower jaw in two series somewhat enlarged, especially posteriorly, outer series of four rows in front, gradually reducing to one row posteriorly. Vomer and palate toothless. Tongue short, with rounded free tip. Preoperele with short conical spicules, becoming larger and stronger at angles. Opercles ending in two soft points, the upper smaller. Gill rakers 5–7+9–13, upper one or two and lower one to three rudimentary, the longest 1.06 in filament or 10.74–13.80 (11.91) in head.

Head 3.12–3.44 (3.26), depth 3.10–3.85 (3.42) in standard length. Width of head 1.92–2.40, least depth of caudal peduncle 2.97–3.30, horizontal diameter of eye 4.56–5.38 (5.16), snout 2.73–3.71 (3.44), postorbital 1.69–1.81 (1.75) in head. Distance from snout tip to origin of dorsal 2.78–2.93 (2.86), to origin of ventral 2.88–3.14 (3.01), to origin of anal 1.37–1.68 (1.47) in standard length.

D. X/I/28–30, second spine longest, 1.74–2.44 in head, first dorsal ray 2.90–3.29 in head. A. II, 7–8, second spine very strong, 1.50–2.56 (2.23) in head, nearly as long as the first anal ray which is 1.79–2.16 (1.95) in head. Origin of anal opposite the 11th dorsal ray. Pectoral falciform, 18, its longest ray 1.47–1.59 (1.55) in head. Ventral I, 5, filamentous, its longest ray 1.30–1.53 (1.42) in head. Caudal with 17 rays, its longest 1.31–1.63 (1.42) in head.

Scales cycloid only on snout, preopercle and anterior of cheek, elsewhere ciliate. Soft dorsal naked with a basal sheath of 2 or 3 small scales. Anal fin entirely naked. Lateral line parallel with the dorsal profile, with 49 tubes, distantly bifid, plus 4 on caudal base. 9 scales in transverse series from origin of dorsal to lateral line and 11–12 scales from origin of anal to lateral line. 44–48 predorsal scales. 19–22 scales around caudal peduncle. Posttemporal with soft flat spines.

Color silvery, darker above than below, each scale above level of middle pectoral rays with a central dark spot forming stripes along each row of scales; those from posttemporal rising to end of spinous dorsal obliquely upward, three lowermost under posterior half of soft dorsal become parallel to lateral line and pass to end of caudal peduncle, those above still oblique to end of dorsal. Those lines below lateral line nearly parallel to body axis, but rising somewhat to meet lines above until opposite anal fin, where they become parallel to lateral line. Scales along soft dorsal base colorless, breaking black stripes which are continued on both dorsal fins by a brown spot at base of each ray. Dorsal and caudal fins marked with brown on membranes. Membrane of spinous dorsal wholly black. A black in upper axil of pectoral and

upper angle of opercle. Anal stippled with brown. Other fins colorless.

This species resembles *mitsukurii* very much in coloration, yet differs in having a distinctly included lower jaw, longer snout and fewer number of gill rakers. It also differs from Günther's *Corvina cuja* or Lin's *Wak cuja* in possessing a naked soft dorsal, wider interorbital distance, and much included lower jaw.

Described from 11 specimens including types were collected at Giran, ranging from 201 mm. to 267 mm in total length and 168 mm to 217 mm in standard length.

Nibea albiflora (Richadson)

Corvina albiflora Richardson, 1846, p. 226 (type locality, Canton)._____Bleeker 1873, p. 142 (reference).

Sciaena albiflora Günther, 1873, p. 378 (Chefoo)._____Jordan and Thompson, 1911, p. 249, fig. 2 (Port Arthur, Manchuria)._____ Jordan and Metz, p. 36, fig. 27 (copied) (Korea).

Nibea albiflora Jordan and Hubbs, 1925, p. 243, (Hamada) Japan._____Reeves, 1927, p. 10 (Chefoo record)._____Lin, 1935, p. 22, fig. 12 (Chusan, Shantung). _____Matsubara, 1937, p. 31, figs. 1a-a (Fusan)._____Lin, 1938, p. 541 (Chusan; Kwangtung; Foochow; Fusan)._____ Herre, 1945, p. 118 (Tinghai, Chusan Island)._____Fowler, 1949, p. 41 (China).

Johnius albiflora Fowler, 1933, p. 385 (Shanghai; Foochow).

Body oblong, compressed, the greatest thickness of the body 2.11 in its greatest depth. Dorsum rising about an angle of 30 to the body axis upward from snout tip to origin of dorsal, thence sloping downward gradually to the base of end of soft dorsal. Upper edge of caudal peduncle concave to the caudal. Venter convex, not so arched as dorsum. Head slightly pointed, moderate. Eye anterior and above, its lower margin above horizontal through commencement of gape of mouth. Mouth terminal, slightly oblique; lower jaw included in closed mouth. Maxillary concealed for the most part under preorbital sheath, extending to middle of eye. Snout slightly projecting with four pores on tip, upper three in a curved row, lateral ones ovate, middle one triangular, the lower one larger and triangular immediately over rostal margin which is incised into four lobes, lateral two deeper. Nostrils two in front of eye, posterior one larger, oval and elongated, midway between eye and anterior one which is smaller and rounded. Lips thick, fringed along edge near teeth. Five distinct pores on chin, the median one being two slits on two sides. Teeth in upper jaw of two rows, inner row in villiform bands, outer row of distant, conical and enlarged teeth. Lower jaw with an inner closed-set series of conical and enlarged and outer row of three in front, two lateraly and one posteriorly. Vomer and palate edendate. Tongue short, with rounded free tip. Preopercle with rather firm, strong, bony spines a little larger than inner row of mandibles, becoming larger and more widely set at the angles than upper and lower edges. Operculum with two flat spines, neither of them extending beyond the gill-membranes. Posttemporal distantly and weakly denticulated. Gill-rakers 6+11, extreme one or two rudimentary, the longest 2.2 in filament or 3.56 in eye or 17 in head.

Head 3.04, greatest depth 3.06 in standard length. Width of head 2.21, height of head 1.30, least depth of caudal peduncle 3.46, horizontal diameter of eye 5.13, interorbital distance 4.98, snout 3.61, postocular part of head 1.81 in head. Distance from snout tip to origin of dorsal 2.78, to origin of pelvics 2.93, to origin of anal 1.37. Least depth of caudal peduncle 2.13 in its length.

Dorsal fin X/I/29, the first dorsal spine short, second spine longest, 2.84 in head, first dorsal ray longest, 3.40 in head. Anal fin II, 8, its first spine strong and elongated, 2.90 in head, or 1.22 in first anal ray which is 2.41 in head. Origin of anal opposite the 12th dorsal ray. Pectoral fin 16, falciform, its longest ray 1.39 in head. Pelvics I, 5, its longest ray 1.99 in head. Caudal irregularly rhomboidal, its longest ray 1.62 in head.

Scales ctenoid save on anterior and lower part of head; soft dorsal with a basal sheath of two rows, anal similar, caudal scaled at base. Lateral line arched concurrent with dorsal profile, with 48 branched tubes plus three on caudal base. Pectoral axilla with a soft and scaly sheath. Predorsal with about 40 scales; 18 scales around caudal peduncle.

Orange yellow in alive specimen. In formalin, white below level of pectorals; above this, each scale has a brown spot, making brown stripes along each row of scales running obliquely to lateral line. In pectoral axil a small deep blackish spot on inner bases of rays, continued a distance on rays. Dorsals broadly edged with brownish black on distal halves, the spinous dorsal more strongly. Caudal dusky. Other fins colorless. Opercular blotch dark. Gill-cavities very dark. Lower half of head orange yellow.

Described from a specimen 290 mm in total length, 242 mm in standard length, collected at Keelung. This fish is not commonly seen at fish market in Taiwan. It is only abundant in the East China sea and Yellow sea.

The present species resembles *N. sina* in general characters and is very difficult to separate them.

Nibea sina (Cuvier and Valenciennes)

Corvina sina Cuvier and Valenciennes, 1830, p. 122 (Type locality: Pondicherry; Malbar; Japan).

Sciaena sina Günther, 1860, p. 292 (compiled).

Johnius sina Fowler, 1933, p. 388 (Arabia; East Africa; India; East India; Philippines; China)._____Smith, 1953, p. 226 (East Africa).

Pseudosciaena sina Weber and Beaufort, 1936, p. 513 (Singapore; Sumatra; Borneo).

The species is very closely related to *Nibea albiflora* (Richardson) which is common in the seas of Japan, Korea, Manchuria and China coast, having more gill-rakers (6+11 in *N. albiflora*, only extreme one rudimentary while 6+8 in the present species, extreme two or three rudimentary), narrower interorbital space and different coloration after catching.

Body oblong, compressed, its greatest thickness 2 in its greatest depth. Dorsum rising about an angle of 40 to the body axis upward from snout tip to origin of dorsal, thence slightly arched to the origin of soft dorsal from where the dorsal profile sloping downward to the base of end of soft dorsal. Upper edge of caudal peduncle concave to the caudal. Venter slightly convex at belly. Head blunted. Eye moderate, anterior and above, its lower margin far above horizontal through commencement of gape of mouth. Mouth terminal; lower jaw included. Maxillary concealed under preorbital sheath except its hind part, extending to hind border of eye. Snout blunted, with four pores on tip, the upper lateral ones slit-like or crescent, and median one irregular, these three arranged in a curved row over the lower median triangular one immediately above the rostral margin, which is deeply incised into two lobes. Nostrils two, in front of eye, posterior one, larger, ovate and elongated, midway between front eye border and anterior nostril which is smaller and rounded. Lips thick, fringed along the edge near teeth. Mandible with five distinct pores on chin, the median one being two slits or a circle interrupted above and below. Teeth of upper jaw in two series, inner series in villiform band, outer series of conical, enlarged and distantly set, the front ones canine-like; Lower jaw anteriorly in three rows, posteriorly in two rows, inner series enlarged, conical and somewhat canine-like; outer series villiform, two rows in front, one row behind. Vomer and palate toothless. Tongue short, with rounded free tip. Preoperculum crenulate, the rounded angle with rather strong denticulation. Operculum with two flat spines, not extending beyond gill-membrane. Posttemporal ciliate. Gill-rakers short, tubercle-like, 6+8, upper two and lower 3 rudimentary, the longest 4.5 in eye or 2.7 in gill-filament or 21 in head.

Head 3.11, depth 2.92 in standard length. Width of head 1.85, depth of head 1.13, least depth of caudal peduncle 3.23, horizontal diameter of eye 5.16, interorbital distance 4.30, snout 3.10, postocular portion of head 1.70 in head. Distance from snout tip to origin of dorsal 2.71, to origin of pelvics 2.94, to origin of anal 1.43 in standard length. Least depth of caudal peduncle 2.42 in its length which is 2.47 in head.

Dorsal fin X/I/30, first spine nearly imbedded, third spine longest 2.00 in head; first dorsal ray the longest, 3.30 in head. Anal fin II, 7, first spine short, second spine strong and elongate, 2.89 in head or 1.15 in first anal ray which is 2.46 in head. Origin of anal opposite the 13th dorsal ray. Pectoral fin 17, falciform, its longest ray 1.46 in head. Pelvics I, 5, its longest ray 2.00 in head. Caudal fin 18, cunneate, its longest ray 1.78 in head.

Scales cycloid on cheeks, preopercles, interorbital space and snout; elsewhere ciliate. Lateral line arched concurrent with dorsal profile with 51 tubes plus five on caudal base. Eight scales in transverse series from origin of dorsal to lateral line and ten to eleven scales from origin of anal to lateral line. Soft dorsal with a row of scaly sheath on base. A soft and scaly sheath on upper corner of pectoral axilla.

Color blackish gray on back, silvery white on ventral portion of body. Operculum with black blotch. Scales sprinkled with black spots except ventral side of body. Spinous dorsal with black blotch anteriorly Soft dorsal and caudal blackish terminally. Other fins white.

Described from a specimen 285 mm in total length and 241 mm in standard length, collected at Kaochiung fish market on Dec. 30, 1955.

This species in very scarce around coastal waters in Taiwan. It inhabits the South China seas.

Nibea acuta (Tang)

Pseudosciaena acuta Tang, 1937, p. 62, fig. 5 (type locality, Hainan, Kwangtung).

Nibea acuta Lin, 1938, p. 540 (Yang Kiang District)._____Fowler, 1949, p. 45 (compiled).

Body oblong, compressed, its greatest thickness of body 1.52–1.64 in its depth. Dorsum rising about an angle of 20 to the body upward from snout tip to origin of dorsal, thence sloping downward to the base of end of dorsal; the upper edge of caudal. Venter less curved as the dorsum. Head tapering. Eye small, anterior and above, its lower margin just coincident with horizontal through commencement of gape of mouth. Maxillary exposed slightly in its hind portion, extending to hind border of eye. Snout pointed with four distinct pores, upper three in a curved row over the median one immediately above the rostral margin which is incised into four lobes, lateral ones more distinctly. Nostrils two, in front of eye, anterior one small and rounded, posterior one ovate and larger, close to eye. Mandible with five distinct pores on chin, median one in a circle but interrupted above, others in slits. Teeth of upper outer row enlarged and canine-like, of inner row villiform. Mandibular teeth at symphysis in several series, with three large canines on each side in the outer row, others villiform; teeth on lateral and hind mandible in two series, inner series enlarged and conical, distantly separated, outer series in one row, close-set, between larger conical teeth. Vomer and palate edentate. Tongue short, with rounded free tip. Preopercular limb weakly denticulated at the angle. Gill-rakers very short, 6+7, upper four and lower two rudimentary, longest 2.50 to 3.50 in gill-filament which is 8.5–9.15 in head.

Head 3.17–3.45, greatest depth 3.30–4.00 in standard length. Width of head 1.77–2.09, height of head 1.55–1.78, least depth of caudal peduncle 3.10–3.34, horizontal diameter of eye 4.90–6.44, interorbital distance 4.58–5.53, snout 3.46–3.55, postocular part of head 1.69–1.70 in head. Distance from snout tip to origin of ventral 2.90–3.30, to origin of dorsal 2.74–2.88, to origin of ventral 2.90–3.30, to origin of anal 1.40–1.49 in standard length. Least depth of caudal peduncle 2.27–2.61 in its length which is 1.19–1.48 in head.

Dorsal fin X/I/25–27, usually with 27 rays, third spine longest, 2.10–2.49 in head, first dorsal ray longest, 2.95–3.63 in head. Anal II, 7, 2nd spine 4.22–5.27 in head or 2.58 in first anal ray which is nearly two in head. Origin of anal opposite 8th dorsal ray. Pectoral 17–18, falciform, its longest ray 1.38–1.58 in head. Pelvics I, 5, its longest ray 2.00–2.39 in head. Caudal cuneate, 17, its longest ray 1.15–1.45 in head.

Scales on snout, preorbital, and cheek cycloid, otherwise ciliate. Soft dorsal with a basal sheath of two rows, base of anal with one row, caudal to one fourth up to the fin. Lateral line running parallel with dorsal profile, with 49–51 branched tubes, plus 3–4

on caudal base. 7-8 scales in transverse series from origin of dorsal to lateral line and 10 scales from origin of anal to lateral line. Pectoral with a large soft and scaly sheath on axilla. Predorsal with 35-40 scales, 18 scales around caudal peduncle.

In alive specimens orange yellow on ventral side of body, in formalin this color disappears. On back above pectoral fin, dark gray, each scale with a brown spot thus forming oblique lines across lateral lines to dorsal base. In caudal region, these dark line parallel with lateral line. Spinous dorsal black terminally, soft dorsal dusk, concentrated terminally. Caudal dusky. Other fins white. Upper side of body also sprinkled closely with brown dots. Pectoral with black blotch on inner side of base. Other fins white, but sprinked with small black dots. Operculum with black blotch.

Described from eight specimens from Keelung, Taipei, Tainan, and Pingtung. Their total length ranging from 243 to 358 mm and their standard length from 195 to 300 mm. This species is rather common in the fish markets in the south parts of west coast, usually caught by angling.

Nibea goma (Tanaka)

Sciaena goma Tanka. 1915, p. 615 (type locality, Nagasaki, Japan)

Nibea goma Lin, 1935, p. 15, fig. 8 (Shangtung; Chusan Islands)_____Matsubara, 1937, p. 37 (China Sea)_____Lin, 1938, p. 543 (Shangtung; Chuan Islands).___ Fowler, 1949, p. 43 (compiled)_____Liang, 1951, p, 26 (No locality)._____ Chen, 1952 p. 330 (ref.).

Pseudosciaena goma Tang, 1937, p. 57, fig. 3 (Foochow).

Body oblong, compressed, its greatest thickness of body 1.58-1.85 in its greatest depth. Dorsum rising about an angle of 20 to body axis from snout tip upward to origin of dorsal, (slightly concave over eye) thence sloping smoothly to origin of soft dorsal from where the dorsum sloping downward to the base of end of soft dorsal. Upper edge of caudal peduncle concave to the caudal base. Venter not so arched as dorsum. Head somewhat pointed. Eye moderate, above and anterior, its lower margin a little above horizontal through commencement of gape of mouth. Mouth terminal, slightly oblique; lower jaw included in closed mouth. Maxillary concealed under preorbital sheath except posterior dilated part, extending nearly to hind border of eye. Snout rounded, with four proes on tip, upper three in a curved row over the lower median one immediately above the rostral margin, which is distinctly incised into two lobes. Nostrils two, anterior one small, posterior one large and ovate, close to eye. Mandibles with five distinct pores on chin. Teeth of upper inner series in villiform band of four rows interruppted at symphysis, outer series of distinct, conical and enlarged. Mandibular teeth of two series, inner series enlarged and conical, outer series in four rows at symphysis, gradually diminishing in number to one row behind. Tongue short, with rounded free tip. Vomer and palate edendate. Preoperclum weakly denticulated only at angles. Operculum terminating into two flat spines, never extending beyond

the gill membrane. Gill-rakers 5-7+8-9 upper four and lower three rudimentary, the longest 1.60 in filament or 10 in head.

Head 3.10–3.25, greatest depth of body 3.46–3.56 in standard length. Width of head 1.75–2.00, height of head 1.38–1.42, least depth of caudal peduncle 3.30–3.40, horizontal diameter of eye 5.96–6.07, interorbital distance 4.13–4.49, snout 3.62–3.93, postocular part of head 1.67–1.78 in head. Distance from snout tip to origin of dorsal 2.62–2.64, to origin of pelvics 2,74–3.01, to origin of anal 1.34–1.49 in standard length. Least depth of caudal peduncle 2.63–2.16 in its length which is 1.28–1.38 in head.

Dorsal fin X/I/22–24, the first spine short, third spine longest, 1.91–2.15 in head.; first dorsal ray longest 3.10–3.27 in head. Anal fin II, 7, second spine longest, 3.22–3.67 in head or 1.35–1.70 in first anal ray which is 2.18–2.33 in head. Origin of anal opposite seventh dorsal ray. Pectoral 18–19, falciform, its longest ray 1.70–1.90 in head. Pelvic I. 5, its longest ray 2.07–2.13 in head. Caudal 17, its longest ray 1.36–1.39 in head.

Scales ciliate except on snout, preorbital and suborbitals which are cycloid. Soft dorsal with a basal sheath of two rows, anal similar, caudal to one third up to the fin. Lateral line running parallel with dorsal profile, with 49–50 branched tubes plus 3 or four on caudal base. Nine scales in transverse series from origin of dorsal to lateral line, 10 scales from origin of anal to lateral line. Predorsal with 46–52 scales. Circumpedundar scales 18–20. Pectoral axilla with a soft and scaly sheath. Posttemporal smooth.

Whole body brown gray with here and there dotted with larger brown blotches. Operculum blotch indistinct. All fins black.

Two specimens from Provincial Fishery Institute, ranged 310 to 315 in total length and 249 to 256 in standard length, were collected at Keelung, and one specimen 410 mm in total length and 335 mm in standard length was collected at Taipei. This species is common only in the waters north of this Island.

Nibea diacanthus (La Cepède)

Lutjanus diacanthus La Cepède, 1802, pp. 195, 240 (type locality, no locality).

Corvina diacanthus Bleeker, 1873, p. 142 (reference).

Sciaena diacanthus Günther, (Hongkong) 1860, p. 290 (China)._____Seale, 1914, p. 68. (Hongkong)

Sciaena diacantha Herre and Myers, 1931, p. 251 (Hongkong).

Johnius diacanthus Fowler 1929 (1930), p. 611 (Hongkong)._____Herre and Myers 1937, p. 30 (Singapore).

Pseudosciaena diacanthus Weber and de Beaufort, 1936, p. 515 (Singapore; Pinang; Batavira; Java; Madura; Borneo;)_____Tang, 1937, p. 58 (Amoy)._____Herre 1953, p. 474.

Nibea diacanthus Lin, 1938, p. 544 (Chusan, East Saddle Island).

Nebea diacantha Fowler, 1949, p. 44, Fig. 78 (Compiled).

Corvina catalea Richardson, 1846, p. 226 (China Seas; Canton).

Body oblong, compressed, its greatest thickness of body 1.64 in its greatest depth.

Dorsum rising about an angle of 30-40 to body axis upward from snout tip to the origin of soft dorsal which is the highest point, thence sloping downward to base of end of dorsal. Venter a little convex, the lowerest point lying midway between pelvics and anal. Head moderate and blunted. Eye small, anterior and above, its lower margin coincident with horizontal through the commencement of gape of mouth. Mouth terminal, oblique; lower jaw a little included in closed mouth. Maxillary concealed for the most part, extending to the middle of eye. Snout a little pointed, with four semi-circular pores on tip, upper three nearly in a straight line, over lower median one immediately above the rostral margin which is deeply incised into two lobes. Nostrils two in front of eye, posterior one, larger, ovate and elongated lying midway between eye border and anterior nostril which is small and rounded. Lips thick, fringed along the edge near teeth. Mandible with five pores on chin, the median one in interrupted circle. Teeth in jaws in rather villiform bands, an outer series of distant, conical, enlarged, somewhat caninoid teeth, visibly by closed mouth in upper; an inner close-set series of conical enlarged ones in lower jaw. Vomer and palate edendate. Tongue short, with rounded free tip. Preoperculum crunulate the rounded angle distantly denticulated. Operculum with two flate spines, not extending beyond gill membrane. Posttemporal ciliate. Gill-rakers short, 4+7, the longest 2.5 in eye or gill filament.

Head 3.30, greatest depth 3.83 in standard length. Width of head 1.59, least depth of caudal peduncle 3.37, horizontal diameter of eye 8.62, interorbital distance 4.31, snout 3.99, postorbital portion of head 1.32 in head. Distance from snout tip to origin of dorsal 3.02, to origin of pelvics 2.73, to origin of anal 1.40 in standard length. Least depth of caudal peduncle 2.80 in its length

Dorsal fin X/I/23, the first dorsal spine short; 2.5 in eye, third or fourth spine longest, 2.01 in head, first dorsal ray longest, 2.70 in head. Anal fin II, 7, first spine very short, second spine 4.14 in head, about half as long as the first anal ray. Origin of anal opposite 6th or 7th dorsal ray. Pectoral fin 18, falciform, its longest ray 1.74 in head. Pelvics I, 5, its longest ray 2.02 in head. Caudal fin 18, rhombic, its longest ray 1.74 in head.

Scales ciliate on head and on body. Lateral line arched concurrent with dorsal profile, with 50 branched tubes plus three on caudal base. Eight to nine scales in transverse series from origin of dorsal to lateral line and 14 scales from origin of anal to lateral line. Soft dorsal and anal with a row of scaly sheath. A soft and scaly sheath on upper corner of pectoral axilla. Predorsal with 40 scales.

Body slate gray except on ventral portion of head. All fins black, more concentrated on terminal edges. No distinct black blotch on operculum. Pectoral sheath black.

Described from a specimen 830 mm in total length, 710 mm in standard length, collected from Keelung. This species is rather common in the fish market along west coast and a component of so-called Min Croakers.

Summary of Taiwan Sciaenoid fishes

1. Genus *Sciaena*

1. *Sciaena dussumieri* (Cuvier and Valenciennes)

2. Genus *Otolithes* Oken

2. *Otolithes argenteus* Kuhl and Van Hasselt.

3. Genus *Miichthys* Lin

3. *Miichthys mi-iuy* (Basilewsky).

4. Genus *Pseudosciaena* Bleeker

4. *Pseudosciaena crocea* (Richardson)
5. *Pseudosciaena manchurica* (Jordan and Thompson)

5. Genus *Argyrosomus* de la Pylaie

6. *Argyrosomus nibe* (Jordan and Thompson)
7. *Argyrosomus macrocephalus* (Tang)
8. *Argyrosomus japonicus* (Schlegel)
9. *Argyrosomns pawak* Lin
10. *Argyrosomus argentatus* (Houttuyn)

6. *Johnius* Bloch

11. *Johnius carutta* Bloch
12. *Johnius dussumieri* (Cuvier and Velencieunes)

7. *Nibea* Jordan and Thompson

13. *Nibea giranensis* sp. nov.
14. *Nibea albiflora* (Richardson)
15. *Nibea sina* (Cuvier and valenciennes)
16. *Nibea acuta* (Tang)
17. *Nibea goma* (Tanaka)
18. *Nibea diacanthus* (La Cepede)

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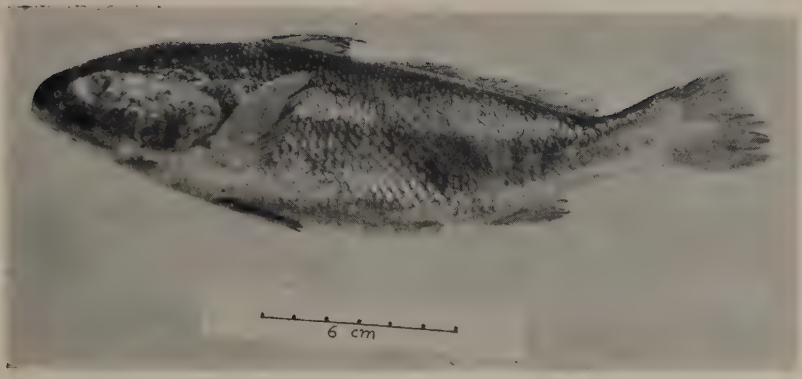

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Plate 2

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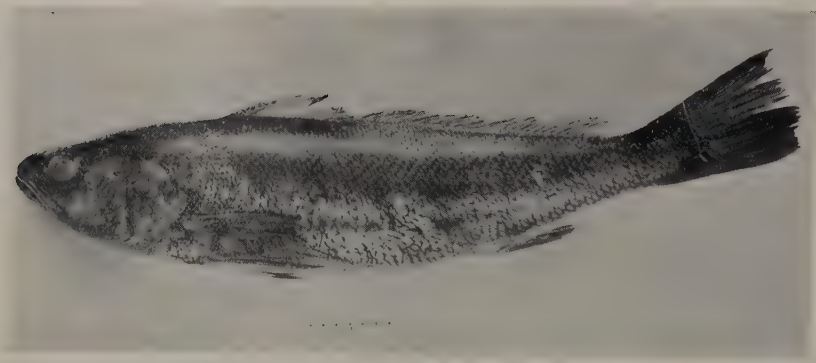

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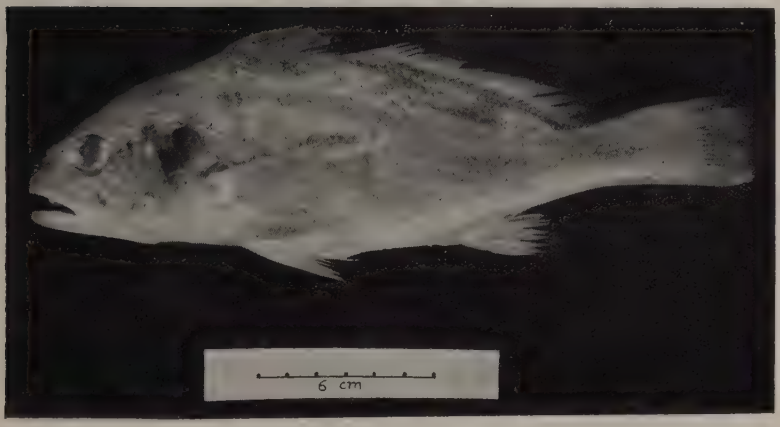

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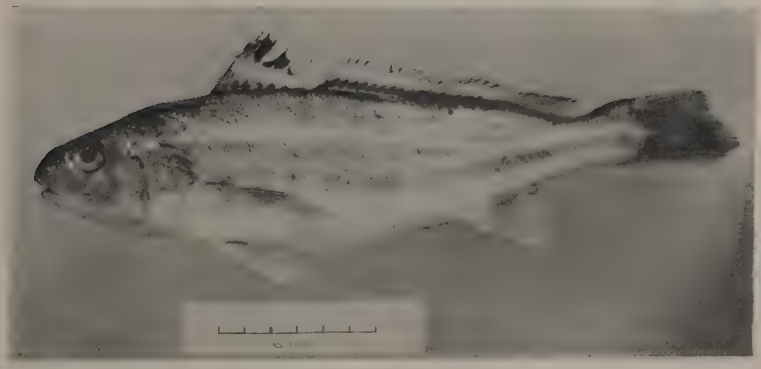

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Plate 4

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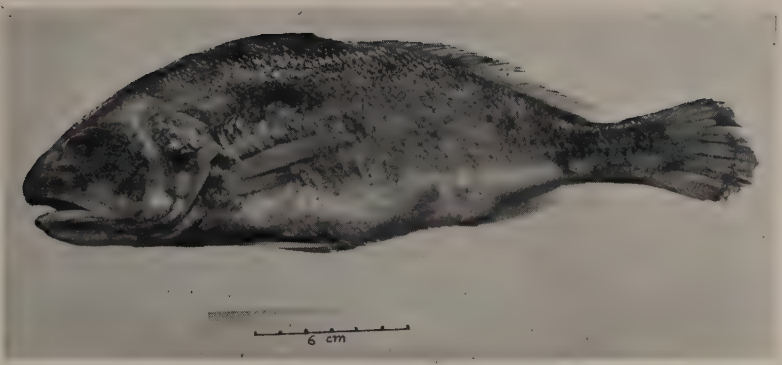

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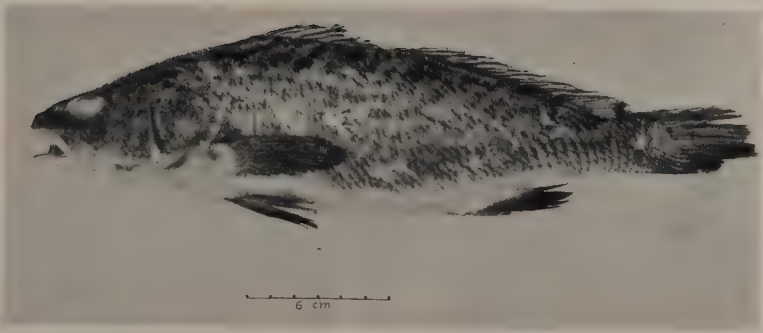

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ILLUSTRATIONS

Plate 1

Fig. 1. *Sciaena dussumieri* (Cuvier and valenciennes)

2. *Otolithes argenteus* Kuhl and Van Hasselt.

3. *Miichthys mi-iuy* (Basilewsky)

Plate 2

Fig. 1. *Argyrosomus nibe* (Jordan and Thompson)

2. *Argyrosomus macrocephalus* (Tang)

3. *Argyrosomus japonicus* (Schlegel)

Plate 3

Fig. 1. *Argyrosomus pawak* Lin

2. *Argyrosomus argenteus* (Houttuyn)

3. *Johnius carutta* Bloch

Plate 4

Fig. 1. *Johnius dussumieri* (Cuvier and Valenciennes).

2. *Nibea giranensis* sp. nov.

3. *Nibea albiflora* (Richardson)

Plate 5

Fig. 1. *Nibea sina* (Cuvier and Valenciennes)

2. *Nibea acuta* (Tang)

3. *Nibea goma* (Tanaka)

4. *Nibea diacanthus* (La Cepede)

臺灣石首魚類之研究

朱　光　玉

根據漁增會的統計，一九五五年漁產量中石首魚類達八千噸以上，計白口 4,799噸，黑口 3,058噸，鮸魚 326 噸，黃花魚 45 噸。其產量雖然不能和年產二萬噸的虱目魚相比，但在其他科中是產量最大的一科了。所謂白口，在上述統計中包括三種；鮸魚是大形的石首魚，內含三種；至於黃花魚是指大黃花，小黃花而言。

石首魚科

體長而側扁；硬背鰭和軟背鰭間有缺口；臀鰭有二棘；側線通至尾鰭頂端；胸鰭基部上方有一條軟突起；尾鰭不分叉；齒多數是小的，但有些亦有犬齒，鱗非常精緻，有分枝，可做魚膠。生活於溫度較高的海水中，有些生活在很深的海水中，但多數在淺水中生活。肝臟中含甲種維他命的成份比鱈魚高數倍。

屬的檢索表

1a. 下巴有一鬚……鬚鮸屬

1b. 下巴無鬚

2a. 下頷中央有一强大犬齒，上頷前方有二强大犬齒……三牙屬

2b. 上下頷前方無此種强大犬齒

3a. 下巴有小孔，不顯明，二、四，或六，是成對的

4a. 軟背鰭至少有三分之一葺基部有小圓鱗

5a. 軟背鰭和全部蓋有小圓鱗……黃花屬

5b. 軟背鰭僅基部三分之一處蓋有圓鱗……小鮸屬

4b. 軟背鰭基部僅有一列或二列的鱗……口鮸屬

3b. 下巴有明顯的五個孔

6a. 軟背鰭鮸有細小鱗片……魷口屬

6b. 軟背鰭上無鱗……白鮸屬

1. 鬚鮸 (Sciaena dussumieri)
2. 三牙 (Otolithes argenteus)
3. 大黃魚 (Pseudosciaena crocea)
4. 小黃魚 (P. manchurica)
5. 小鮸 (Miichthys miiuy)
6. 黑口 (Argyrosomus nibe)

7. 巨首鯰 (A. macrocephalus) 即臺灣白口
8. 日本巨鯰 (A. japonicus)
9. 林氏鯰 (A. pawak)
10. 日本白口 (A. argentatus)
11. 魷口 (Johnius carutta)
12. 杜氏魷 (J. dussumieri)
13. 春占 (Nibea giranensis sp. nov.)
14. 白花鯰 (N. albiflora)
15. 沙鯰 (N. sina)
16. 尖頭鯰 (N. acuta)
17. 花鯰 (N. goma)
18. 巨鯰 (N. diacanthus)

本文所舉十八種石首魚，除 1, 3, 4, 5, 6, 14, 17 七種陳兼善先生的臺灣脊推動物誌中記載外，(陳先生的白米魚和白鯰即本文中之巨首魚)，本文中新添十種臺灣未曾記載的魚和一種新種。

STUDIES ON THE FRESHWATER ALGAE OF TAIWAN SCENEDESMACEAE FROM TAINAN[1]

Eugene Y. F. SHEN[2]

The present account deals only with the family Scenedesmaceae of Tainan, including both known and a few new species and varieties. The writer plane to report on other families of algae later.

Although Japanese phycologists made extensive studies on the marine algae of Taiwan, very little has been done on the freshwater forms. Heydrich, F., 1894,[3] on the algae of the South-eastern Asia, listed only one filamentous freshwater algae (*Rhizoclonium hieroglyphicum* (Ag.) Külz.) from Taiwan. A brief study on the freshwater algae of Lanyu have been made in 1932 by Okada K.[4]; who had also described a new spieces, *Prasiola formosanum*, from Taiwan later in the year 1936.[5] Schwabe, G. H. reported five filamentous blue green algae from Taipei on 1947.[6] In 1950 and 1955 the writer reported 54 species of freshwater algae from Mount A-Li,[7] and 40 species of phytoplankton from the University Pond at Ch'i-T'ou.[8]

The present investigation is based on the writers own collections from Tainan during the time from October 1955 to August 1956.

In this paper an attempt is made not only to report the interesting species and their distribution to the professional phycologists but also to give the beginner who wishes to work on Scenedesmaceae in Taiwan a usuable manual. For this reason working keys, a full description and original drawing of each species and varieties are included.

SCENEDESMACEAE

The Scenedesmaceae are Chlorococcales reproducing only by means of autospores and in which the autospores produced by any cell always remain attached to one another in autocolonies in which the cells have a definite orientation. Coenobe of 2-4-8 or more cells (always a multiple of two). Cells spherical, ellipsoidal, acicular, triangular, or trapezoidal and without ornamemtantion or with their walls bearing ridges or spines. Generic distinctions within the family are based chiefly upon the manner in which the cells are oriented with respect to one another.

(1) This investigation was supported by funds provided by the Institute of Fishery Biology of Ministry of Economic Affairs and National Taiwan University.

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(3) HEYDRICH, F., 1894, Hedwigia 30:267-306.
(4) OKADA K., 1932, Bull. Biogeogr. Soc. Japan 3:36-62.
(5) OKADA K., 1936, Journ. Jap. Bot. 12:451-459.
(6) Schwabe, G. H., 1947, Blaualgen and Lebensraum, in Acta Botanica Taiwanica 1:No. 1:3-82
(7) SHEN, Y. F,, 1950, Taiwania 1:347-357.
(8) SHEN, Y. F., 1955, Taiwania No. 6:13-22.

KEY TO THE GENERA

1. Cells spherical to broadly ellipsoidal, having delicate setae, generally in compound coenobia ..... *Micractinium*
1. Cells not spherical ..... 2.
2. Cells with long axes parallel ..... *Scenedesmus*
2. Cells with long axes radiate or quadrate ..... 3.
3. Long axes radiating from a common center ..... *Actinastrum*
3. Long axes quadrate ..... 4.
4. Cells without spines ..... *Crucigenia*
4. Cells with spines ..... *Tetrastrum*

SCENEDESMUS Meyen, 1829

Coenobe a flat (rarely curved) plate of ellipsoidal, ovoid, or acicular cells arranged in a single, alternating, or double series and with their long axes parallel to one another. The number of cells in a coenobe is always a multiple of two. Cell wall smooth, corrugated, granulate, or spicate; with or without marginal or lateral teeth or spines. Chloroplast single, parietal, and laminate in young cells; frequently filling entire cell in older colonies; pyrenoid single.

Reproduction by the crosswise division of the protoplast leading to form autocoenobia which are liberated by rupture or gelatinisation of the membrane of the parent cell; syncoenobia are rare. Globular resting spores are known in a few species.

KEY TO THE SPECIES

1. Wall smooth, without spines or teeth 2
1. Wall decorated with spines, teeth, or ridges 7
2. Cells ovoid to cylindrical, with rounded ends 3
2. Cells fusiform, with pointed ends 5
3. Cells all in one plane 4
3. Cells arranged to form a curved (usually double) series ..... *S. arcuatus*
4. Cells arranged in a single series (sometimes in an indefinitely alternating series) ..... *S. bijuga*
4. Cells definitely arranged in a double series ..... *S. platydisc*
5. Cells all in one plane 6
5. Cells not all in one plane, coenobia curved ..... *S. acuminatus*
6. Cells fusiform and side in contact straight ..... *S. obliquus*
6. Cells both fusiform and crescent-shaped in the same colony, and side in contact not straight ..... *S. dimorphus*
7. Cells with longitudinal ridge only, no teeth ..... *S. acutiformis*
7. Cells with teeth, spines, and sometimes ridges also 8
8. Cells with teeth or spines only 9

8. Cells with both teeth or spines and ridges.....16
9. Cells with 2–3 sharp teeth at the poles..... *S. denticulatus*
9. Cells with long, sharp teeth or spines.....10
10. Spines on only the terminal cells of the series.....11
10. Spines on both the terminal and inner cells of the series.....14
11. Cells cylindrical or ovate, adjoined along their entire lateral walls.....12
11. Cells naviculoid or subquadrate, not adjoined along their entire lateral walls....13
12. Terminal cells of the coenobe with a spine on each pole (with 4 spines on a coenobe)..... *S. quadricauda*
12. Terminal cells of the coenobe with a spine on one pole only (with 2 spines on a coenobe)..... *S. diagonalis*
13. Cells naviculoid, attached along the middle 1/3–2/3 of their lateral walls ..... *S. opoliensis*
13. Cells subquadrate, lateral walls of inner cells concave; attached only at the corners..... *S. perforatus*
14. Spines arising from both the poles and from faces of cells..... *S. abundans*
14. Spines arising from the poles of the cell only.....15
15. Cells oblong or cylindrical, with rounded ends ..... *S. longus*
15. Cells naviculoid narrowed at the poles..... *S. opoliensis*
16. Cells oblong or cylindrical, with broadly round ends..... *S. armatus*
16. Cells naviculoid narrowed at the poles..... *S. carinatus*

Scenedesmus obliquus (Turp.) Kuetzing, Linnaea 8:609, 1833. (Pl. IV, fig. 7)

Colony composed of 2–8 fusiform cells arranged in a single series; apices of cells apiculate; wall smooth; cells 4–8 μ in diameter, 14–18 μ long.

S 107, S 119, S 131, scarce.

Scenedesmus bijuga (Turp.) Lagerheim, Nuova Notarisia, 4:158, 1893. (Pl. I, figs. 1–4)

Colony composed of 2–8 cells in a single flat series; cells ovate or oblong, without teeth or spines; cells 4–8 μ in diameter, 8–16 μ long.

S 138, S 105, S 111, S 107, S 108, common.

var. *alternans* (Reinsch) Hansgirg ; Prodromus der Algenflora von Böhmen. Heft 2. Archiv. f. Natur. Landes von Böhm., 6 (No. 5):114, 1888. (Pl. I, figs. 5–7)

Cells ovate or elliptic, regularly arranged in 2 alternating series; cells 4–8 in diameter, 7–16 μ long.

S 140, S 112, S 113, fairly common.

Scenedesmus arcutus Lemmermann, Forsch. Biol. Stat. z. Plön, 7:112, 1899. (Pl. I, figs. 11, 12)

Cells arranged to form a curved (usually double) series of 4–16 oblong-ovate individuals with lateral walls in contact along 1/3 to 1/2 their length; cell wall without spines or teeth; poles of the cell broadly rounded; cells 3–8 μ in diameter, 6–15 μ long.

A 102, S 143, fairly common.

Scenedesmus platydisc (Smith) Chodat, in Revue d'Hydrologie, 3:175, fig. 68; (=*Scenedesmus arcuatus* Lemm. var. *platydisca* G. M. Smith, op. cit., 451, pl. 30, figs. 101–105.) (Pl. I, figs. 13, 14)

Plant composed of 8 cells arranged in a flat, rather than a curved, double series; cells oblong-elliptic, 4.5–7.5 μ in diameter, 8–17 μ long.

S 105, A 102, fairly common.

Scenedesmus quadricauda (Turp.) de Bréb., in Brébisson & Godey, Mem. de la Soc. Ac. de Falaise 1835, p. 66. (Pl. II, figs. 4–6)

Colony consisting of 2–4–8 oblong-cylindric cells usually in 1 series; outer cells with a long curved spine at each pole; inner cells without spines or with mere papillae at the apices; cells variable in size, 3–18 μ in diameter, 9–35 μ long.

S 112, S 138, common.

var. *longispina* (chod) G. M. Smith, Trans. Wis. Acad. Sci., Arts, & Lett. 18 (2):467, pl. 30, f. 121–125, 1916. (Pl. II, figs. 7, 8)

Cells smaller, spines much longer than the type. Cells 3.5 μ in diameter, 9–11 μ long; 4-celled coenobia 9–11 μ in diameter, 12–16 μ long; spines 5–10 μ long.

S 112, S 127, scarce.

Scenedesmus diagonalis S. Fang, Contr. Biol. Lab. Sci. Soc. China Bot. Ser. 9:97–107, 1933. (Pl. II, figs. 1–3)

Colony consisting 4 oblong-cylindric cells in 1 series; outer cells with a long curved spine at one pole only, diagonally inserted; inner cells without spines; cells 3–6 μ in diameter, 7—11 μ long.

S 106, scarce.

Scenedesmus longus Meyen, Nova Acta Acad. Caes. Leop.-Carol., 14:774, 1829. (Pl. IV, fig. 4)

Colony composed of 2–4–8 oblong-cylindric cells arranged in a single series; apices of both inner and outer cells with 1 or 2 sharp spines which are longer on the outer cells; cells 4–6 μ in diameter, 8–12 μ long.

S 119, scarce.

Scenedesmus armatus (Chod.) G. M. Smith, Trans. Wis. Acad. Sci., Arts, & Let. 18: 460, 1916. (Pl. IV, fig. 3)

Plant composed of 2–8 cells arranged in a single, partially alternating series, oblong-ellipsoid but with ends broadly rounded; terminal cells with a single, long, usually curved or unevenly bent spine at each pole; central cells with a median, incomplete longitudinal ridge; cells 6–7 μ in diameter, 9–12 μ long.

S 135, rare.

Scenedesmus perforatus Lemmermann, Arkiv f. Bot., 2: No. 2, p. 159, 1904. (Pl. III, fig. 13; Pl. IV, fig. 5)

Cells subrectangular with convex end walls and concave lateral walls, thus forming biconvex intercellular spaces; end cells of the colony bearing a single long curved

spine at each pole arising from the corner of the cells, the outer lateral walls of the end cells straight or umbonate; cells 4–5 μ in diameter, 12–20 μ long, spine 16–18 μ long; with larger cells than the type.

S 141, S 138, fairly common.

Scenedesmus abundans (Kirch) Chodat, Monographie d'algues en culture pure. Matér. pour la Tlore Crypt. Suisse, 1 (No. 3): 77, 1913. (Pl. III, fig. 8)

Cell oblong or ovate, in a linear series of 4, the terminal cells with 1 or 2 polar spines and 2 spines on the lateral wall, the inner cells with a spine at each pole; cells 4–7 μ in diameter, 7–12 μ long.

S 125, S 143, rare.

var. *longicauda* G. M. Smith, Tran. Wis. Acad. Sci. Arts, & Letters, 18:467, 1916. (Pl. III, fig. 6)

Cells smaller than the typical, with relatively longer spines; cells 3–6 μ in diameter, 7–9 μ long; spines 6–10 μ long.

S 143, S 138, scarce.

var. *brevicauda* G. M. Smith, Trans. Wis. Acad. Sci., Arts, & Letters 18:468. (Pl. III, fig. 7)

Cells smaller than the typical; spines shorter and fewer; cells 2–4 μ diameter, 5–7 μ long; spine 1.5–4 μ long.

S 138, rare.

Scenedesmus denticulatus Lagerheim, Förhandle, 39 (No. 2):61, 1882. (Pl. III, fig. 9)

Colony composed of 4 or 8 ovate cells arranged in a single or altarnating series; apices of cells with 1–4 short teeth; free walls of cells smooth; cell 6–10 μ in diameter, 8–15 μ long; teeth 3–4 μ long.

S 140, fairly Common.

var. *minor* var. nov. (Pl. III, fig. 10)

Coenobiis 4 cellaribus in seriem linearem; cellulis omnibus cylindraceo-obovoideis, polis rotundatis 3–4 μ latis, 5–7 μ longis, 1–2 dentatis.

This variety differs from the typical form in being smaller and with fewer teeth.

S 108, rare.

Scenedesmus acutiformis Schroeder, Forsch. Biol. Stat. z. Pön', 5:45, 1897. (Pl III, figs. 11, 12)

Cells arranged in a single series of 4 (2 to 8), fusiform-elliptic, with poles sharply pointed; inner cells with a single facial longitudinal ridge; outer cells with 2–4 longitudinal ridges; cells 4–5 μ in diameter, 9–12 μ long. Smaller than the type.

S 140, S 132, scarce.

Scenedesmus diamorphus (Turp.) Kuetzing, Flora, 16:608, 1833, (Pl. IV, figs. 1, 2)

Colony composed of 4 or 8 fusiform cells arranged in a single or alternating series; the inner cells with straigth, sharp apice; the outer cells lunate, strongly curved, with acute apices; cells 3–6 μ in diameter, 16–22 μ long.

S 104, S 138, common.

Scenedesmus acuminatus (Leg.) Chodat, Matér. pour la Flore Crypt. Suisse, 1 (No.

3):211, 1902. (Pl. I, figs. 8–10)

Cells arranged in a curved series of 4 (rarely 8) cells strongly lunate, with sharply pointed apices, the convex walls adjoined inwardly, the concave faces directed outward; cells 3–7 μ in diameter 28–40 μ long.

S 106, 108, fairly common.

Scenedesmus opoliensis P. Richter, Zeit. f. Angw. Mikro., 1:3–7, 1896. (Pl. III, fig. 3)

Colony composed of 2–4–8 naviculoid cells arranged in a single series, with free walls of outer cells convex, the lateral adjoined walls in contact along 1/3 of their length; apices of cells with long spines (inner cells with a spine at one pole only, or sometimes without spines); cells 6–8 μ in diameter, 14–26 μ long.

S 138, S 142, common.

Forma, (Pl. III, fig. 4); Coenobe composed 4 naviculoid cells arranged in a single series, the lateral adjoined walls in contact along 2/3 their length; apices of the terminal cells with a long spine on each pole, one of the inner cells with two spines at one pole; cells 3–4 μ in diameter, 8–10 μ long.

This form differs to the type in smaller size and has two spines on one pole of an inner cell.

A 102, scarce.

var. ***diagonalis*** var. nov. (Pl. III, fig. 1, 2)

Coenobiis 2–4 cellularibus in seriem linearem; cellulis navicula'eloos; 6–7 μ latis, 14–18 μ longis; extimis in uno pole aculeolatis, disponere diagonalis; aculeis ad 15–28 μ longis.

Colony composed of 2–4 naviculoid cells arranged in a single series, the lateral adjoined walls in contact along 1/3–2/3 of their length; apices of the outer cells with a long spine at one pole only, and the position inserted diagonally to the coenobe; cells 6–7 μ in diameter, 14–18 μ long.

It differs to the type in having the diagonally inserted spines on the outer cells of the coenobe.

S 111, scarce.

var. ***dispar*** var. nov. (Pl. III, fig. 5)

Coenobiis 4–cellularibus in seriem linearem; cellulis navicula; 4–6 μ latis, 8–9 μ longis, extimis utroque polo aculeolatis aut in uno pole aculeolatis; medianis in uno polo aculeolatis cum aut extra in centers breviter dentatis, aculeis ad 7–9 μ longis.

Colony composed of 4 naviculoid cells arranged in a single series, adjoined along 1/3–2/3 of the length of their lateral walls; apices of cells with a long spine at each poles or one poles only; cells 4–6 in diameter, 8–9 μ long.

S 139, scarce.

Scenedesmus carinatus (Lemm.) Chodat, Rev. d'Hydrol., 3:71–258, 1926. (Pl. IV. fig. 6)

Colony composed of 2–4–8 naviculoid cells arranged in a single series, with free walls of outer cells convex, the lateral adjoined walls in contact along 1/3 of their

length; cells with a longitudinal ridge on each side; each pole with 2-3 teeth; outer cells bearing a long, curved spine at each pole.

S 103, S 141, common.

var. *diagonalis* var. nov. (Pl. IV, fig. 8)

Coenobiis 4-cellularibus in seriem linearem; cellulis navicula; cum montis dorsum; 5-7 μ litis 12-14 μ longis; extimis in uno pole aculeolatis disponere diagonalis, et in centero 2-3 breviter dentatis; aculeis ad 15-25 μ longis.

A variety differs from the type by its losting of a long spine on each pole of the outer cells. (with two spines instead of 4 spines inserted symetrically on the 4 corners of the coenobium).

S 111, fairly common.

CRUCIGENIA Morren 1830

Coenobia free-floating, composed of four cells quadrately arranged to form a flat or slightly curved plate with a quadrangular open space at the center. Multiple coenobia are due to the presence of a gelatinous envelope or to a persistence of portions of mother-cell walls that unite the coenobia one to another. Cells flattened; elliptical, triangular, trapezoidal, or semicircular in surface view, with a smooth cell wall. Chloroplast 1-4, parietal, discoid to laminate, each usually contains a single pyrenoid.

Reproduction by autocolony formation, the 4 cells of the coenobium generally producing autocolonies at the same times.

KEY TO THE SPECIES

1. Cells ovoid to ellipsoid 2
1. Cells triangular, opening at the center of the colony very small..... 3
2. Coenobium generally regular.....*C. rectangularis*
2. Coenobium often irregular.....*C. irregularis*
3. Outer free walls straight.....*C. tetrapedia*
3. Outer free walles convex.....*C. quadrata*

Crucigenia rectangularis (A. Braun) Gay, Recherches sur le development et la classification de quelques algues vartes, p. 100, 1891. (Pl. V, fig. 1)

Colony free-floating, consisting of ovate or oblong cells, very regularly arranged about a rectangular central space in 2 pairs, with the apices adjoining; chloroplast 1-4 parietal discs, with a pyrenoid in each; cells 4-7 μ in diameter, 5-10 μ long.

S 135, S 143, scarce.

Crucigenia irregularis Wille, Biol, Centralble., 18:302, 1898. (Pl. V, fig. 2)

Colony free-floating, consisting of 4, or multiples of 4 ovate cells not definitely arranged about a central space as in other species of the genus and not in quadrangular formation, with both lateral and apical walls in contact; chloroplasts broad parietal plate or disc, as many as 4 in a cell; pyrenoid sometimes absent; cells 5-9 μ in dia-

meter, 8–14 μ long.

S 136, S 139, fairly common.

Crucigenia quadrata Morren, Ann. Sci. Nat. Bot., 20 (Ser. 1): pp. 415, 426, 1830. (Pl. V, fig. 3)

Colony free-floating, consisting of circular plate of 4 triangular cells, cruciately arranged about a small central space, the outer free wall of the cells broadly convex, the lateral walls straight, adjoined throughout their length with neighboring cells and covering toward the center of the colony; walls sometimes with knob-like projections, chloroplast parietal discs, as many as 4 in a cell; pyrenoids not always present; cells 2.5–6 μ in diameter, 3–7 μ long; multiple quadrate colonies formed by the close arrangement quartets.

A 102, fairly common.

Crucigenia tetrapedia (Kirch.) West & West, Trans. Roy. Irish Acad., 32 (B):62, 1902. (Pl. V, figs. 4, 5)

Colony free-floating, consisting of 4 triangular cells cruciately arranged about a minute central space; outer free wall and lateral walls straight, the angles acutely rounded; chloroplast a parietal plate with a single pyrenoid; cells 4.5–9 μ in diameter, frequently forming a rectangular plate of 16 cells (4 quatets).

A 102, common.

TETRASTRUM Chodat 1895

Coenobia of Tetrastrum have the same quadrate arrangement of the cells that is found in Crucigenia, but they are very rarely joined to one another to form multiple colonies. The chief difference between this genus and Crucigenia is the ornamentation of the free face of the cells with one or more spines. The cells contain one to four parietal chloroplasts that are with or without pyrenoids.

KEY TO THE SPECIES

Outer faces of cells with single projection ..... *T. tetracanthum*

Outer faces of cells with one long spine and one short straight spine on each cell ..... *T. heterocanthum*

Tetrastrum tetracanthum (G. S. West) Brunnthaler (=*Crucigenia tetracantha* G. S. West) in A. Pascher, Die Süsswasserflora Deutschlands, Oesterreichs und der Schweiz. Heft 5. Chlorophyceae 2:178; fig. 263. (Pl. V, figs. 6, 7)

Coenobium rectangular, flat, of 4 cells. Outer face produced into a single, delicately tapering, concave process. Intercellular space lacking. Cell wall punctate.

Reproduction by autospore formation.

4-celled coenobe 8.5–18 μ in diameter (without processes), process 9–18 μ long.

S 102, S 108, S 113, S 141, common.

Tetrastrum heterocanthum (Nordst.) Chod., Bull. Herb. Boiss. 3:113, 1895; Smith, Trans. Amer. Mic. Soc. 45(3): 187, Pl. 15, figs. 16–20, 1926. (Pl. V, fig. 8)

Colony free-floating, consisting of four triangular cruciately arranged about a minute central space; outer free wall longer and straight, the angles acutely rounded; each cell has a long and a short straight spine on the outer face; cells 4–5 μ in diameter, spines up to 9 μ.

S 108, scarce.

ACTINASTRUM Lagerheim 1882

Coenobia free-floating, of 4, 8, or 16 (generally 8) elongate cells that radiate in all direction from a common center. Coenobia sometimes united in multiple coenobia of irregular shape. Chloroplast single, laminate, and parietal, with or without pyrenoids.

Reproduction by longitudinal and transvers division of the protoplast to form 4, 8, or 16 autospores, liberated by the rupture of the mother cell wall.

Actinastrum gracilimum G. M. Smith, Bull. Torr. Bot. Club. 43:480, 1916. (Pl. V, fig. 9)

Cells cylindrical, with very slight narrowed to abruptly truncate poles, forming colonies of individuals with the long axes of the cells radiating in all planes from a common center; cells 1.7–3 μ in diameter, 14–21 μ long; colonies 30–45 μ in diameter.

S 113, rare.

MICRACTINIUM Fresenius 1858

Cells spherical to broadly ellipsoidal and are usually quadrately united in fore-celled coenobia, which are almost always united with one another to form a multiple coenobium. The free face of each cell in a coenobium has one to seven fairly delicate setae with a length several times the diameter of the cell. Chloroplast single, parietal, cupshaped; with one pyrenoid.

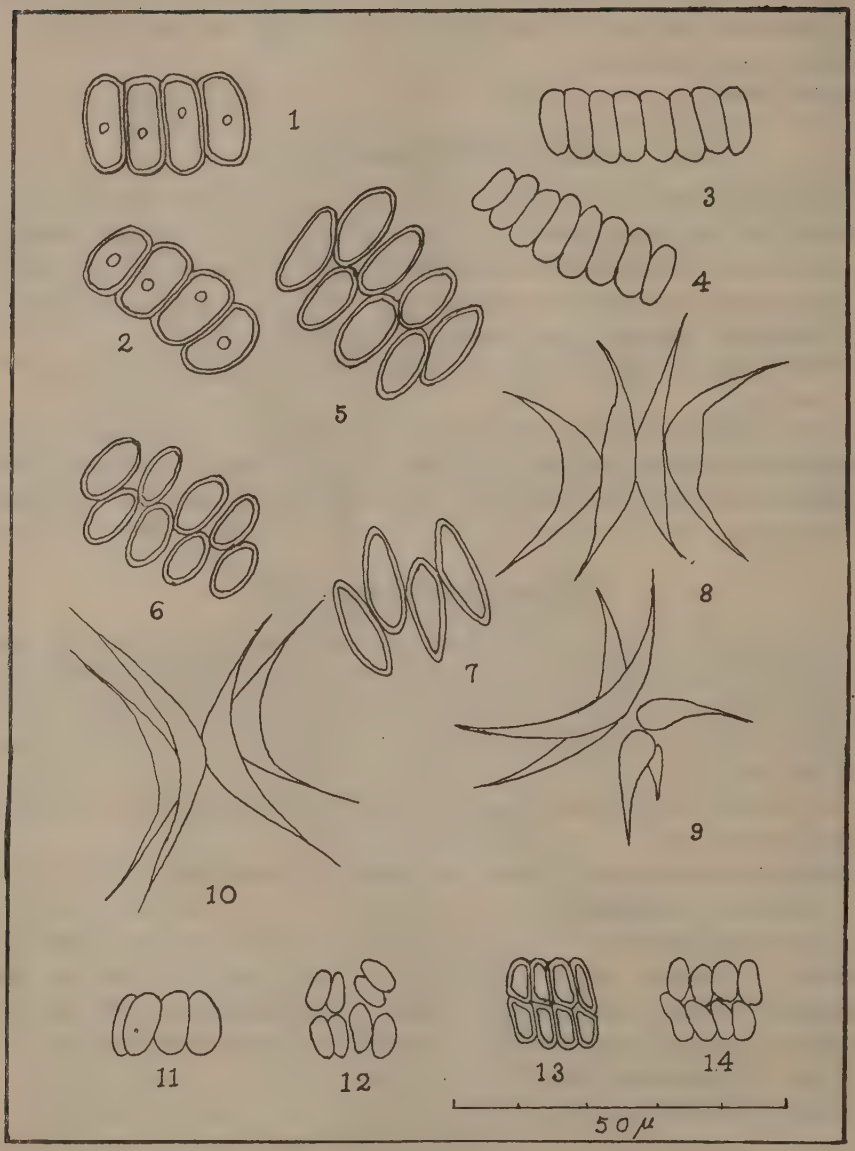
Reproduction by autospores. Korschikov (1937) reports observation of sexual reproduction in this genus.

Micractinium pusillum Fresenius, Abh. Senchenb. Naturf. Ges. 2:236, pl. 11, figs. 46–49, 1858. (Pl. II, fig. 9)

Coenobia free-floating of 4–8–16 or more cells in groups of four and disposed in a quadrate or pyramidate manner with groups of four in turn pyramidately arranged. Cells spherical, with 1–5 long, delicate, hyaline tapering setae on the free surface of the cells. Chloroplast single, parietal, cupshaped; with a single pyrenoid. Cells 3–6 μ in diameter; setae 20–30 μ long.

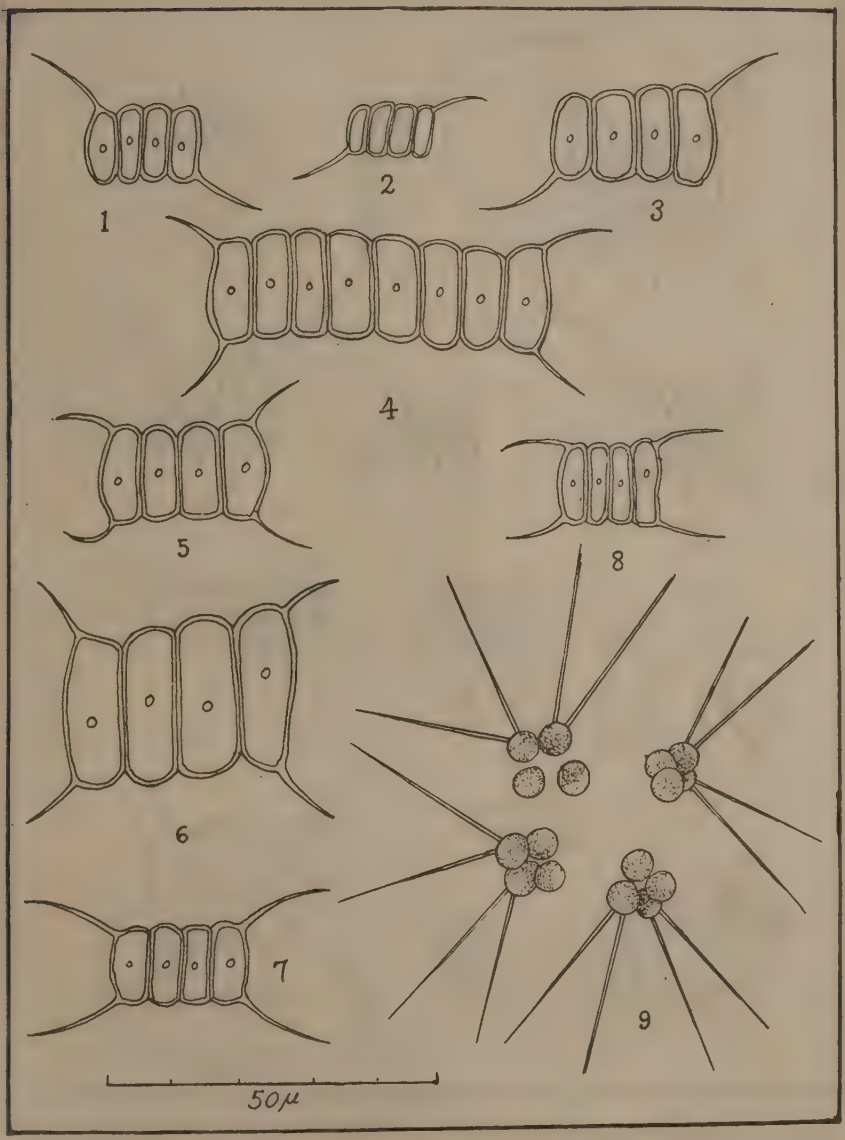
S 107, S 111, scarce.

Plate I



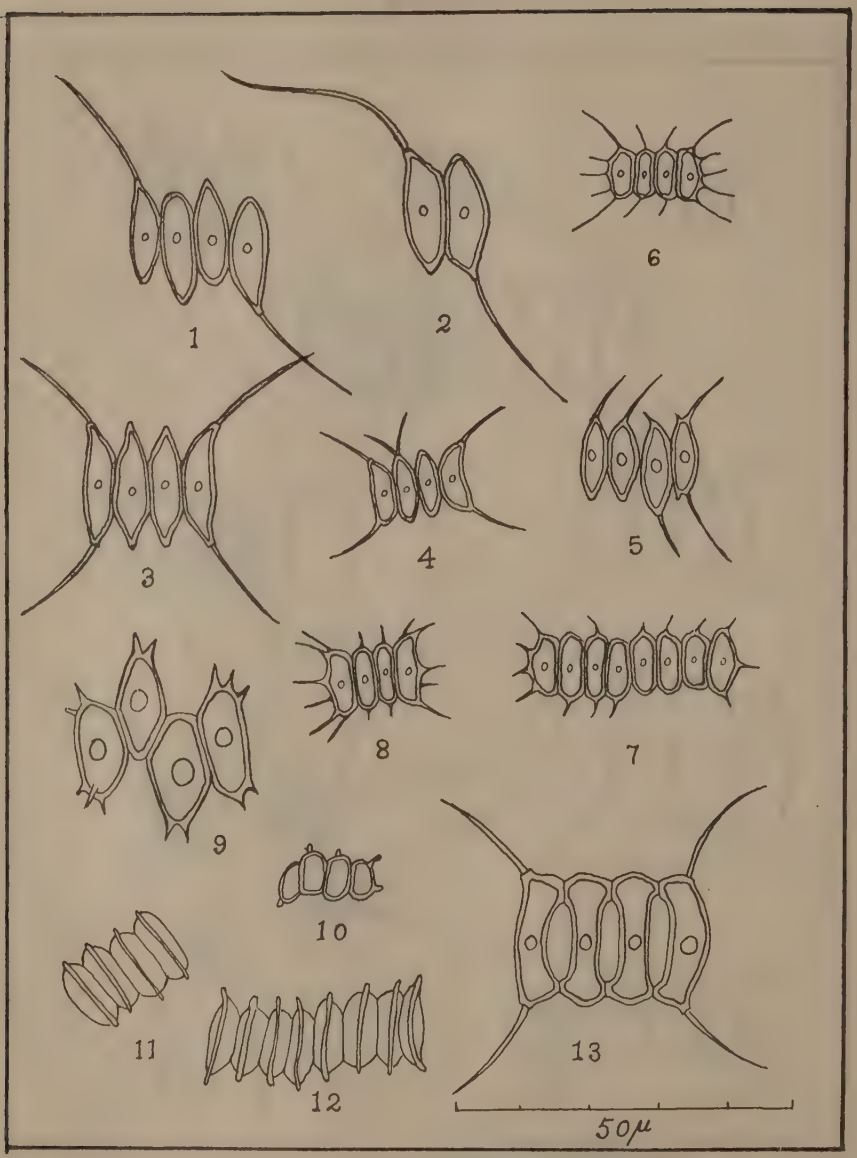
Figs. 1–4. *Scenedesmus bijuga* (Turp.) Lagerheim
Figs. 5–7. *S. bijuga* Lagerheim var. *alternans* (Reinsch) Hansgirg
Figs. 8–10. *Scenedesmus acuminatus* (Leg.) Chodat.
Figs. 11, 12. *Scenedesmus arcuatus* Lemmermann
Figs. 13, 14. *Scenedesmus platydisc* (Smith) Chodat

Plate II



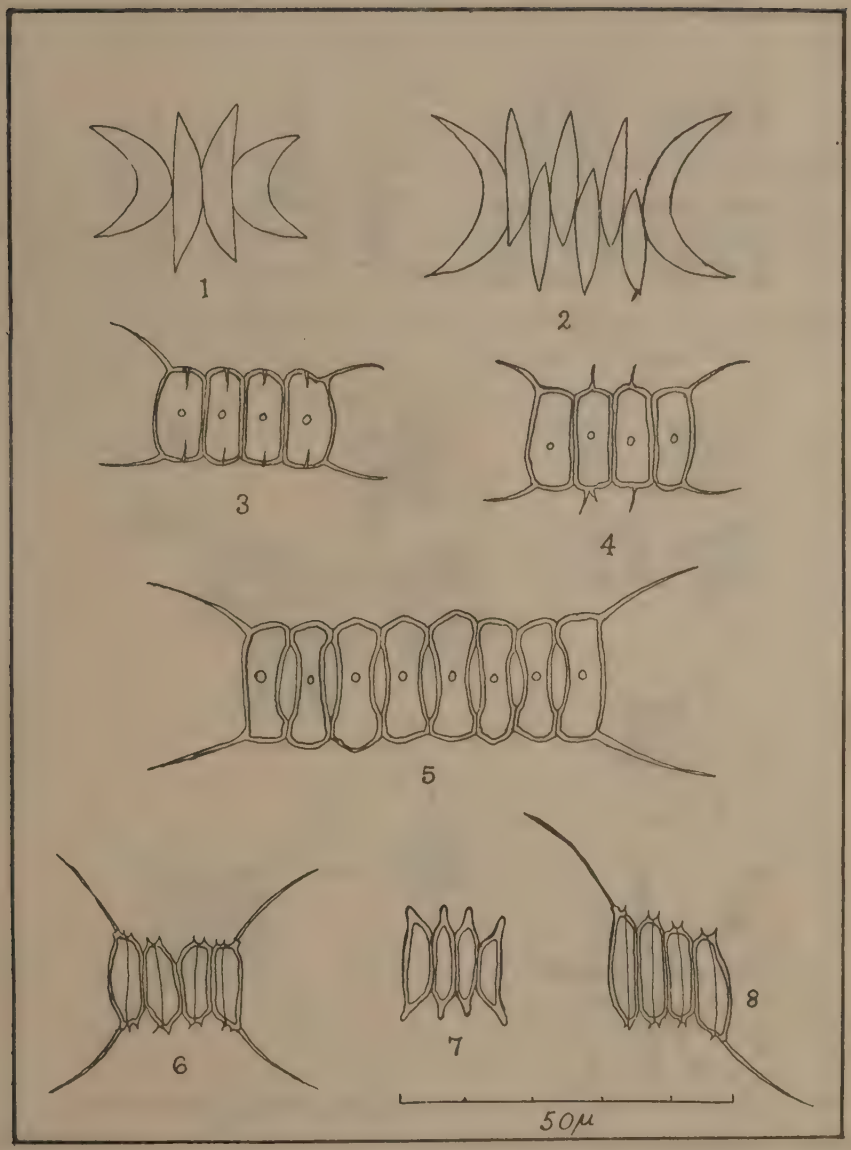
Figs. 1-3. *Scenedesmus diagonalis.* S. Fang
Figs. 4-6. *Scenedesmus quadricauda* (Turp.) de Brebisson
Figs. 7, 8. *Scenedesmus quadricauda* var. *longispina* (Chod.) G. M. Smith
Fig. 9. *Micractinium pusillum* Fresenius

Plate III



Figs. 1, 2. *Scenedesmus opoliensis* Richter var. *diagonalis* var. nov.
Fig. 3. *Scenedesmus opoliensis* P. Richter
Fig. 4. *Scenedesmus opoliensis* P. Richter Forma
Fig. 5. *Scenedesmus opoliensis* Richter var. *dispar* var. nov.
Fig. 6. *Scenedesmus abundans* Chodat var. *longicauda* G. M. Smith
Fig. 7. *Scenedesmus abundans* Chodat var. *brevicauda* G. M. Smith
Fig. 8. *Scenedesmus abundans* (Kirch) Chodat
Fig. 9. *Scenedesmus denticulatus* Lagerheim
Fig. 10. *Scenedesmus denticulatus* Lagerheim var. *minor* var. nov.
Figs. 11, 12. *Scenedesmus acutiformis* Schroeder
Fig. 13. *Scenedesmus perforatus* Lemmermann

Plate IV



Figs. 1, 2. *Scenedesmus dimorphus* (Turp.) Kuetzing
Fig. 3. *Scenedesmus armatus* (Chodat) G. M. Smith
Fig. 4. *Scenedesmus longus* Meyen
Fig. 5. *Scenedesmus perforatus* Lemmerman
Fig. 6. *Scenedesmus carinatus* (Lemm.) Chodat
Fig. 7. *Scenedesmus obliquus* (Turp.) Kuetzing
Fig. 8. *Scenedesmus carinatus* Chodat var. *diagonalis* var. nov.

Plate V

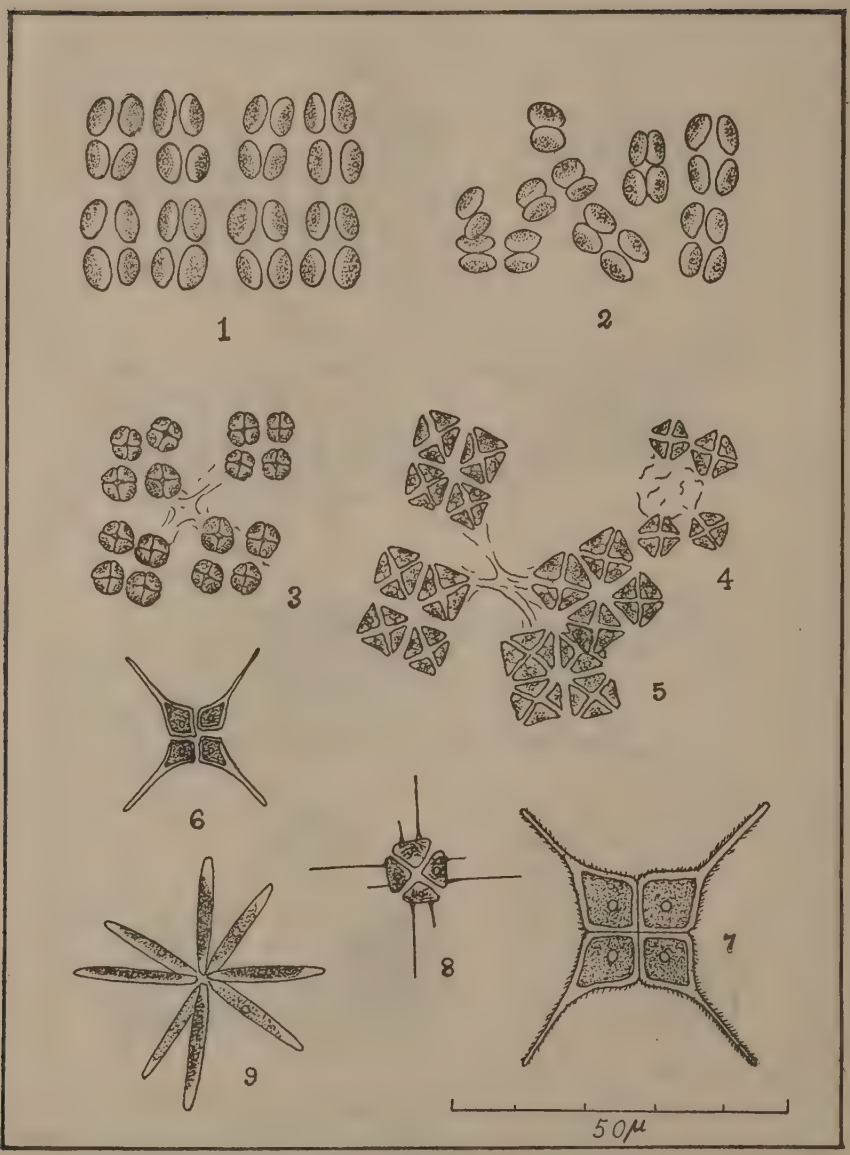


Fig. 1. *Crucigenia rectangularis* (A. Braun) Gay
Fig. 2. *Crucigenia irregularis* Wille
Fig. 3. *Crucigenia quadrata* Morren
Figs. 4, 5. *Crucigenia tetrapedia* (Kirch) West & West
Figs. 6, 7. *Tetrastrum tetracanthum* Brunthaler
Fig. 8. *Tetrastrum heterocanthum* (Nordst.) Chodat
Fig. 9. *Actinastrum gracilimum* G. M. Smith

臺南之星月藻科

沈　毓　鳳

本篇根據作者於四十四年秋至四十五年夏在臺南漁池中及復榮村所採集之材料，觀察報告淡水綠藻中之星月藻科植物。共得五屬(*Scenedesmus, Crucigenia, Tetrastrum, Actinastrum* 及 *Micractinium*)，二十二種，八變種與一新型。其中星月藻 (*Scenedesmus*) 之種類最多，有十六種，八變種及一新型；內有四新變種：——*Scenedesmus opoliensis* Richter var. *dispar*, *Scenedesmus opoliensis* Richter var. *diagonalis*, *Scenedesmus carinatus* (Lemm.) Chodat var. *diagonalis*, 及 *Scenedesmus denticulatus* Lagerheim var. *minor*. *Crucigenia* 有四種， *Tetrastrum* 有二種，*Actinastrum* 一種，*Micractinium* 一種。

STUDIES ON BLACK CROAKER (ARGYROSOMUS NIBE J. & T.) OF THE NORTHERN TRAWLING GROUND OF TAIWAN CONTINUED.

(SUMMARY)

LIU FAH-HSUEN B. Sc. Ph. D.

As the black croaker is one of the important commercial fishes of Taiwan, the writer has began its investigation since July 1953 and a report (I) has been made in 1954. This is a continuous study carried out by the same method and with the same source of matrial as employed in the previous investigation.

The length frequency is indicated in table I and in figures I and 2. As in the previous year, the whole population can be distinguished into four different classes according to the difference of body lengths. They are represented by body lengths of 10cm, 15cm, 20cm, and 25cm, However, there exist the following differences. The young fry represented by 10cm long were found not later than April in the previous year that is 1953 but had been found in this year 1954, late in May and June. The class of 15cm long has been proportionally increased in all months of the year (July 1954 through June 1955) and the growth could only be seen since May, 1955. In the contrast, the class of 20cm long has been proportionally decreased in all months of the year and has became less and less in the subsequent months begining from September, 1954. January 1955, this class had a sudden increase, but totally disappeared in March and reappeared again in April. The sudden increase of this class in January is difficult to explain, because the black croaker seems to migrate south to pass the cold winter as was shown in the previous investigation. It may be due to the restricted fishing operations of this month at southern districts. The class of 25cm long appears in all months except in March, 1955.

Table 2 shows the fishing operation of the 19 trawlers in 1954. It was found that both the total catch (previous year 67,713 boxes,* this year 81,330 boxes) and the catch per unit of effort (previous year 5.25 boxes, this yer 6.00 boxes) are increasing. This is due to the increased fishing effort which has been more concentrated in the fishing centers as shown by number of hauls operated in district 210, which was the best fishing center having 4,882 hauls in 1953 and 7,686 hauls in 1954. However, the catch per unit of effort of the district 210 was markedly decreasing (previous year 10.8 boxes, this year 8.79 boxes). Moreover, the black crorker aggregates more in months between October and Febrary of the following year. It is suggested that the total catch may be possibly increased by increased fishing effort put during these months.

It is concluded that the population size of black croaker is decreasing year after

* Appraximately 23 kg in weight

year because the classes of 3 annuli up has been decreased to below 5% and the catch per unit of effort of district 210 has been reduced to 8.79 boxes in 1954 (11.20 boxes in 1952 and 10.83 boxes in 1953). It is notable that concentration of operation at the districts of greater aggregation of the fish (the fishing centers) has remarkable effect upon the total catch and the catch per unit of effort. This has been shown both in the previous and in the present investigations as the tendency of increase of the total catch (21, 458 boxes in 1952, 67,613 boxes in 1953 and 81,330 boxes in 1954) and of the catch per unit of effort (2.35 boxes in 1952, 5.25 boxes in 1953 and 6.00 boxes in 1954) is clearly shown to be due to the concentration of operations at the districts 210 at which 9,143 hauls in 1952, 12,870 hauls in 1953 and 13,557 hauls in 1954 have been operated.

臺灣北部拖網漁場黑口 (Argyrosomus nibe J. & T.) 之調查 (續)

劉 發 煊　陳 金 城

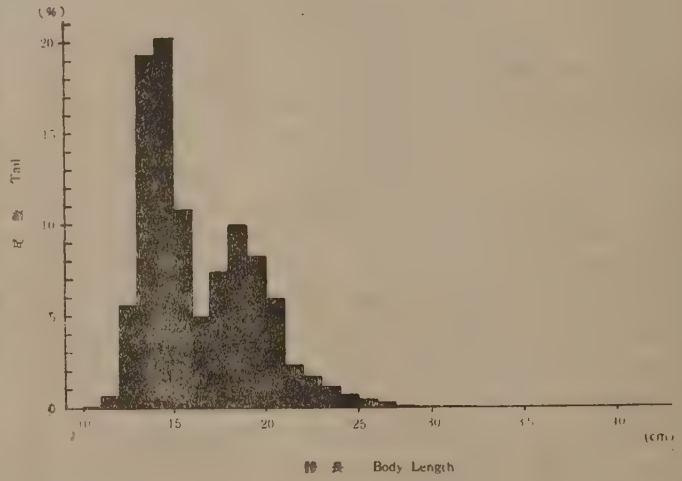
黑口爲臺灣重要底棲魚類漁獲之一，筆者曾於一九五三年七月開始調查，並印有報告 (1) 茲再將繼續調查之結果報告于後：

一、觀　　察

甲、體長組合　黑口一九五四年九月至一九五五年八月之全年體長組合如第一圖，全年漁獲大部以十五公分及二十公分體長爲中心之魚羣，二十公分體長以上之魚羣則異常稀少，已降低至 5 %以下至其分月體長組成，則如第一表及第二圖。大致與上年同，即全部漁獲共分四級，一爲以十五公分體長爲中心之魚羣，二爲以二十公分體長爲中心之魚羣，三爲二十公分體長以上之魚羣，四爲不顯明之十公分以下之魚羣，惟其分月變化有如下之不同。

第一圖　年間體長組合

Fig. 1 Length Frequency Distribution of the Year



1. 以十五公分體長爲中心之魚羣各月份比例增高甚多，且自一九五四年九月以迄翌年四月均不見有增長趨勢，其增長趨勢至翌年五月始可看到，亦較上年顯明。

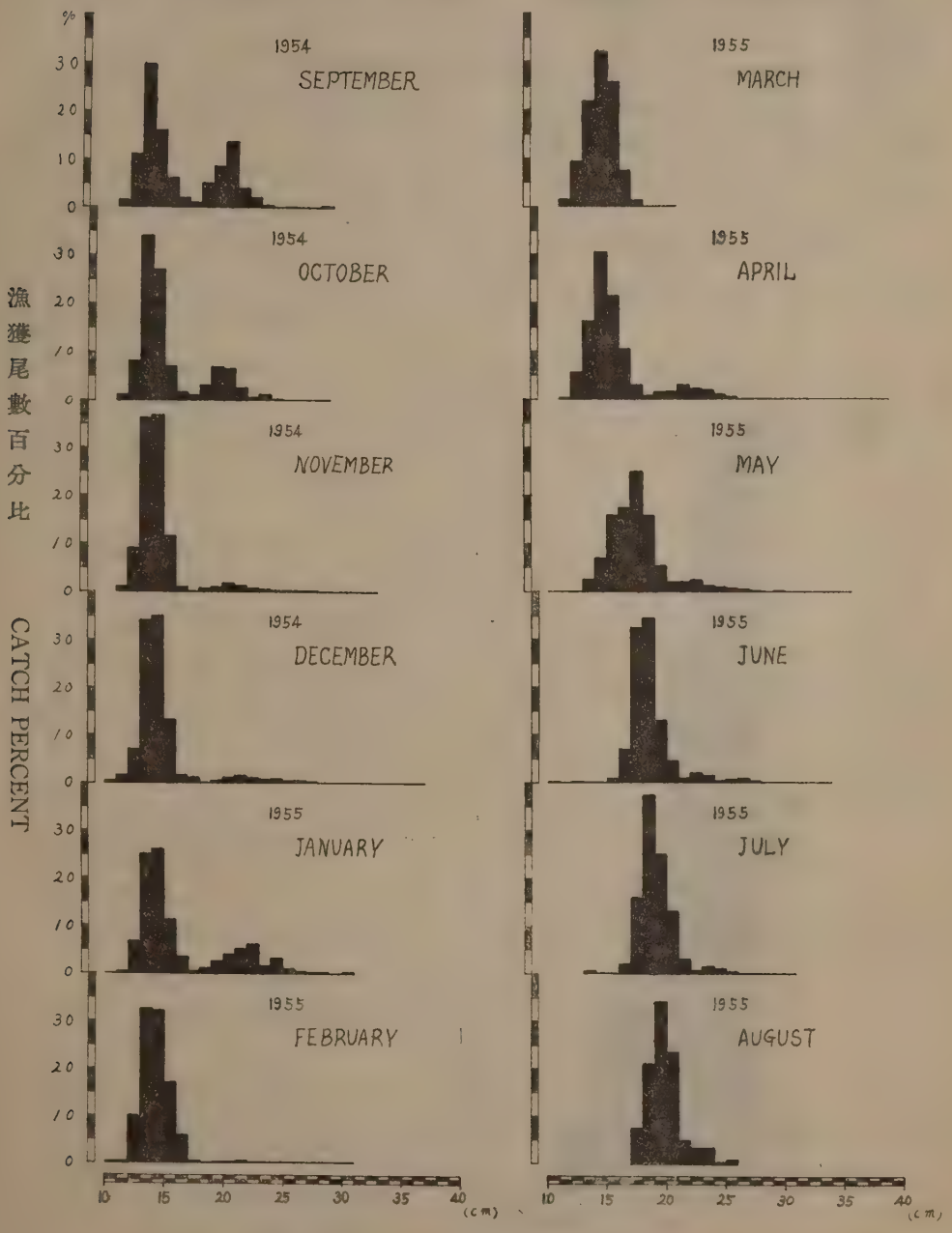
2. 以二十公分體長爲中心之魚羣各月份均比例降低，且其各月變化亦少異，此種魚羣自一九五四年九月開始逐月比例減少，至翌年元月忽又增多，此後于二月突復減少，迄三月幾全消逝，四月又復出現，但迄八月均有逐月比例減少之勢。

3. 以二十五公分體長爲中心其較大之魚羣，除一九五五年之三月外各月均有發現，惟均甚稀少。

4. 十公分體長之幼魚，一九五四年十二月及一九五五年元、二、五、六月均有發現。

第二圖 各月體長組合

Fig. II. Monthly Length Frequency Distribution



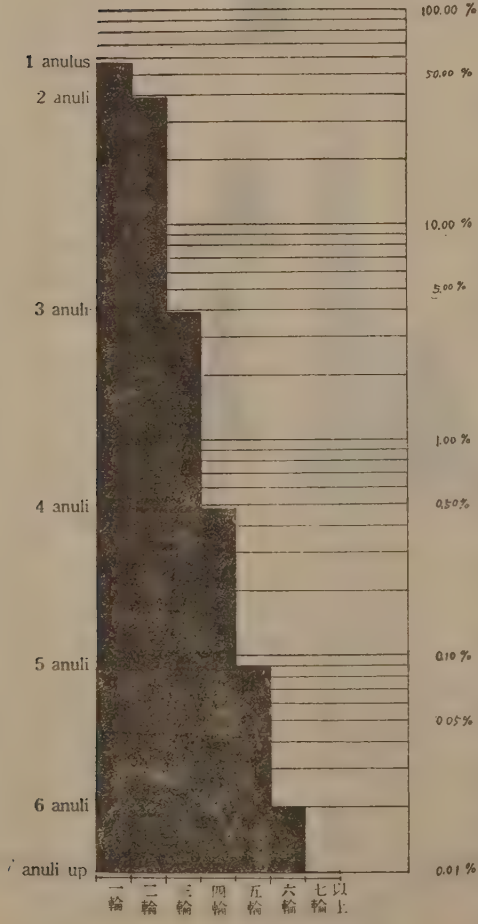
乙、年齡組合　年齡組合如第一表及第三圖，全年漁獲最多者爲一、二輪魚，各年齡之魚中，除二輪魚比例較上年增高外，其他各輪魚均比例降低，尤以三輪以上之各輪魚降低更大，如三輪魚百分比之降低達5％以下（上年度爲8.43％），三輪魚爲主要之親魚，其降低率過高，將影響及于資源量。

丙、漁獲紀錄之分析　一九五四年十九艘拖網輪船之曳網總數爲一五·六二四次，有紀錄者爲一四·六〇三次，其中九三五次係調查區域以外之作業，又在調查區內作業之投網次，有一一一次紀錄不全，茲將一三·五五七投網次之紀錄分析如後：

1. 漁獲量：一九五四年全年總漁獲量爲二九八·二二八箱，其中黑口佔八一·三三〇箱，較往年均有增加，分月而論，黑口漁獲之合計，第一爲十月之一四·二〇七箱，第二爲十一月之一三·八〇三箱，四月最少，僅爲三一七箱，分區而論，第一爲二一〇區之六七·五四四箱，第二爲二一九區，第三爲二七五區，次爲二〇〇區，S區，T區及三八八區，其他各區則在三〇〇箱以下。（第二表）

第三圖　年齡組合（1954年9月至1955年8月）

Fig. III　Age Composition



2. 曳網次數：本年度總曳網次紀錄完整者爲一三·五五七次，五月最多爲一·九五三次，次爲四月及十月，十二月最少，僅四百餘次，分區而論，第一爲二一〇區，爲七六八六次，次爲二一九、二七五、二七三、二一七及二七四各區，均在一·〇〇〇與五〇〇次之間。（第二表）

3. 單位漁獲量：本年度全年爲六、〇〇箱，較一九五二年之二·三五箱及一九五三年之五·二五箱均有增加，其分月之單位漁獲量，以十一月爲最高，爲十一·五七箱，次爲十二月，元月及二月，均在十箱以上，至五、六兩月亦均接近五箱，分區而論，第一亦爲二一〇區，八·七九箱，較一九五二年之十一、二〇箱與一九五三年之十、八三箱均低，可見黑口資源逐年降低之一般。

二、討　　論

1. 體長組合之變化　本調查所見體長組合之變化（第二圖）足供注意者有二點，（一）十公分體長之小魚一九五四年十二月迄一九五五年五、六月尚有發現，且六月份發現特多，此種小魚樣品鱗均脫落，不能辨別其年齡，惟查黑口產卵季節甚長，每年三月開始常延至七、八月間始停止（一、三），各月出現之小魚或係不同月份所孵化者，但一九五五年元、二月份之小魚則應爲先年所產而生長遲緩之小魚，（二）以二十公分體長爲中心之魚羣自一九五四年九月以迄十二月均逐月減少，翌年元月忽增多，二、三月則幾不見其踪跡，四月方復出現，此魚羣元月份之增多，似不合理，因黑口自九月以後，較大之魚羣常向南移動，作越冬之準備，晚春始復北返，元月不當增多，其所以然者，因係漁船作業狀態各年不同所致，一九五四年元月，較南漁區中如二一七、二一九、二一八、二七五、二七七、三八八及S、T諸區，均有作業，（第二表），而一九五二及一九五三年元月份在此漁區幾全無作業，此種現象表示不同漁區有不同之體長組合，舉辦資源調查，應爲注意。

2. 資源量　黑口之資源量在調查區內，本年度較上年度降低尤甚，就生物測定方面觀之，三輪以上之親魚已降低至5％以下，如果漁獲努力今後繼續更集中，則甚危險，就漁獲記錄觀之，則總漁獲量與全年總單位漁獲量均有增加，一九五二年之黑口總漁獲量爲二一、四五八箱，一九五三年爲六七、六一三箱，一九五四年爲八一、三一〇箱，又一九五二年之單位漁獲量爲二、三五箱，一九五三年爲五、二五箱，一九五四年則爲六·〇〇箱，此係由于漁獲努力之增加與集中所致，一九五二年之漁獲努力爲九、一四二曳網次，一九五三年爲一二、八七〇曳網次，一九五四年則爲一三、五五七曳網次，可見歷年漁獲努力增加之一般，二一〇區爲黑口集中之中心區，即密度最大之漁區。三年來在此區之漁獲努力逐年增加甚多，一九五二年此漁區之曳網次爲一、五四八次，一九五三年爲四·八八二次，一九五四年則爲七、六八六次，漁獲努力逐漸集中于中心漁區，爲使歷年總漁獲量增高之一大原因，惟此中心漁區之單位漁獲已在逐年降低如二一〇區之單位漁獲在一九五二年爲一一、二〇箱一九五三年爲一〇·八三箱，一九五四年則爲八·七九箱，一九五四年之降低已較一九五三年者大，所幸者目前漁獲努力尚未能集中于旺季如在十至二月黑口聚集密度較大諸月漁獲努力增加，總漁獲量在目前資源狀態下或尚可增加不少，但對資源之摧毀將太大。

三、結　　論

甲、黑口資源量一九五四年較一九五三年降低更多，因三輪以上之親魚已降至5％以下，二一〇區黑口中心漁區之單位漁獲已降至八·七九箱。

乙、不同漁區之體長組合有不同之趨勢。

四、參 考 文 獻

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（2）木部崎修、眞子渺：東海口於けるクログチの成熟について

（3）西海區水產研究所：東海、黃海口おける底魚資源の研究

第一表　體長組成及年齡組合表

Table 1. Length Frequency Distribution & Age Composition

時期 Time / 體長 % / Length in cm.	1954 九月 Sep.	十月 Oct.	十一月 Nov.	十二月 Dec.	1955 一月 Jan.	二月 Feb.	三月 Mar.	四月 Apr.	五月 May.	六月 June.	七月 July.	八月 Aug.	年間之體長組成表 Length frequency of the year	年輪數 No. of anulus	年齡組合 Age Composition
11				0.42	0.09	0.23			0.15	0.21			0.09		
12	1.55	1.09	1.13	1.48	0.53	0.23	1.51	0.21					0.64		
13	10.82	8.28	8.71	6.94	6.60	10.31	9.34	5.65		0.21			5.57	I	56.61
14	29.67	34 18	34.75	33.94	25.18	32.57	22.08	16.36	2.56		0.54		19.32		
15	15.72	26.42	37.03	34.93	25.79	32.26	32.31	30.69	6.91				20.17		
16	5.74	6.85	11.58	13.20	11.22	16.87	25.79	21.39	15.96	1.08	0.18		10.82		
17	1.77	1.58	0.75	1.48	3.63	5.69	7.48	10.52	17.49	7.42	1.87		4.97		
18	0.93	1.06	0.05	1.01	0.54	0.56	1.29	2.88	24.94	32.52	15.87	7.47	7.43		
19	4.88	3.15	0.53	0.04	1.17			0.59	15.75	34.08	37.93	21.26	9.95	II	38.81
20	8.62	6.68	0.67	0.57	2.72	0.13	0.10	1.23	5.55	12.85	24.91	33.91	8.16		
21	13.49	6.38	1.62	1.06	4.07	0.13	0.09	1.33	2.09	4.67	13.06	23.56	5.96		
22	3.64	2.49	1.12	1.27	5.15	0.26		2.90	2.12	1.19	2.72	5.17	2.34		
23	2.06	0.58	0.57	0.92	5.97	0.31		2.24	2.29	1.86	0.36	3.47	1.72		
24	0.42	0.86	0.34	0.63	1.63	0.07		1.83	1.33	1.52	1.39	3.45	1.12	III	3.98
25		0.25	0.21	0.74	3.25	0.13		1.03	1.07	0.48	0.73	0.57	0.71		
26	0.16	0.03	0.24	0.35	1.09	0.11		0.48	0.67	0.65	0.20	1.15	0.43		
27		0.02	0.22	0.58	0.54	0.05		0.15	0.46	0.72	0.19		0.24		
28	0.06		0.25	0.20	0.27	0.02		0.17	0.22	0.31	0.02		0.13	IV	0.48
29	0.47	0.10	0.09	0.12	0.27	0.02		0.03	0.07	0.12	0.02		0.11		
30				0.05				0.08	0.22	0.05	0.01		0.03		
31			0.09	0.00	0.28	0.05		0.10	0.05	0.03	0.01		0.05	V	0.09
32			0.02	0.00				0.01	0.02	0.01			0.01		
33			0.01	0.05				0.05	0.02				0.01		
34				0.01				0.02	0.02	0.02			0.01	VI	0.02
35				0.01				0.01	0.02				0.00		
36				0.00				0.02	0.02				0.00		
37				0.00				0.01					0.00	VII & VII >	0.01
38															
39								0.02					0.00		
Number of tails examined 測定尾數	596	898	852	516	610	428	709	779	1,006	644	636	174	合計 Total 7,848		

勘誤表
Errata

面 Page	行 Line	字 Word	誤 Error	正 Correction
1	1	8	Produces	produces
1	15	4	jsponicus	japonicus
2	35	1	non	none
3	17	3	MARCROCEPHALUS	MACROCEPHALUS
3	29	15	sinnce	since
3	30	3	workrs	works
4	11	4	aggregate	aggregates
5	16	7	pike=silver	pike or silver
5	21	6	Shlegel	Schlegel
6	2	2	Gulorhimus	Galeorhinus
7	12	22	字後漏掉(第二圖)三字	22字後加(第二圖)三字
47	2	12	plane	plans
47	8	5	have	has
47	13	8	Writers	Writer's
62	14	2	became	become
62	28	8	Crorker	Croaker
67	32	10	日	に
67	33	13	日	に

中華民國四十五年十一月發行

編輯兼發行 經濟部 國立臺灣大學 合辦漁業生物試驗所

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